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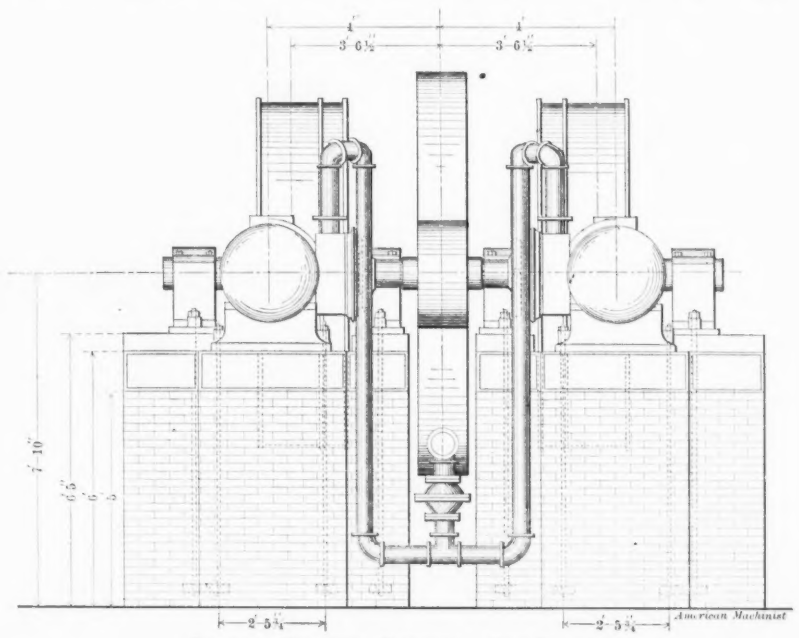
Geared Hoisting Engines.

We give on this page and on page 2 three views of a pair of geared hoisting engines recently put in operation at one of the mines of Senator Davis and James G. Blaine, in Western Virginia. These engines are designed for hoisting coal out of deep mining shafts; the depth of shaft in this case being over two hundred feet, and it is expected that these engines will hoist anywhere from sixteen hundred to two thousand tons in ten hours.

The cylinders are 16 inches in diameter, 30 inches stroke; they stand 8 feet apart between their centers, and are connected to one engine shaft with heavy disk balanced cranks set at right angles. The connecting rods and valve rods are made of hammered steel, and their boxes are lined with phosphor bronze. The pistons have self-adjusting packing rings. The bearings of the crosshead are comparatively long and wide; and the wrist pins are large. The steam is distributed by a link motion of the usual design. A heavy pinion fitted onto the engine shaft engages with a master gear 10 feet in diameter, 14 inch face, the pitch being 3½ inches. The master wheel is firmly keyed to the center of a large steel drum shaft, which carries two winding drums 8 feet diameter and of sufficient width to take a 1½-inch steel wire rope of a length to hoist two hundred and fifty feet. Each drum is made in one piece, and bored out to a good fit on the shaft and keyed to it with two keys. The drum shaft runs in four heavy bearings lined with babbitt metal of the best quality. The engines and drums are operated entirely from a position behind the three levers and quadrants shown in the plan. One of the levers operates the throttle valve, one the links, and one the brakes.

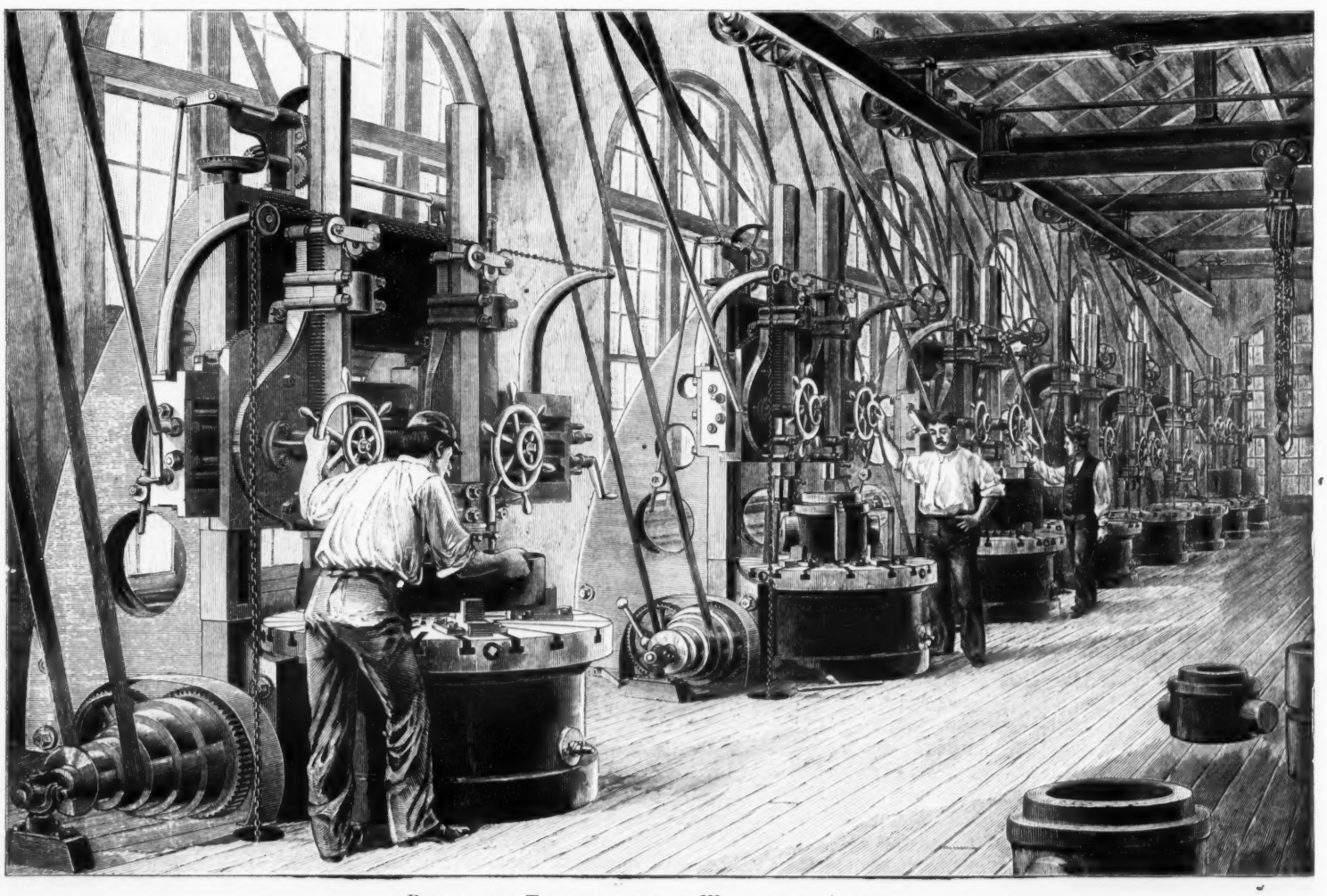
Ample provisions have been made for removing the foundation bolts, should it be necessary at any time to do so. The engines are very strongly built and well put together, so as to be durable, and suitable for the severe service to which engines of this class are subjected. These engines were built by J. & J. B. Milholland, 240 Fifth avenue, Pittsburgh, Pa. This firm makes a specialty of building hoisting and haulage engines for coal ore, in mines, on tramways and other services.



GEARED HOISTING ENGINES.—SEE PAGE 2.

Boring and Turning-mills at Watervliet Arsenal.

We present herewith an engraving giving a view of what is perhaps the most remarkable display of boring and turning-mills to be seen in this country. The engraving was made from a photograph taken at the Watervliet Arsenal, West Troy, N. Y., the machines having been put in by the Niles Tool Works, of Hamilton, Ohio, about a year ago.



BORING AND TURNING-MILLS AT WATERVLIET ARSENAL.

They are used in making heavy ordnance, hoops for built-up guns being bored and turned on them. Six of the mills swing 5 feet diameter, the remaining two, 6 feet diameter. The fact that eight boring-mills of the same design are used in the same establishment is not, of course, in itself, so very remarkable, but the fact that the authorities were able, owing to the arrangement of the shop and the character of the work to be done, to place the machines together in a row, as here seen, makes of them a display which is admired by every one interested in machine tools and shops.

Two new alloys for making boring and cutting tools have been invented in England. The metal equals steel in hardness and temper, and does not lose its temper when heated by friction. The alloys consist of pig-iron, ferro-manganese, chromium and tungsten in proper proportions, melted together in crucibles under stick charcoal and calcined borax. This compound is then re-melted with bar-iron, and proportions of nickel, copper and aluminum are added. It is then cast in sand molds.

It is now proposed to connect Sweden and Denmark by a tunnel through the Oeresund. Through, not under it, a huge iron pipe, big enough for passenger trains to run in, is to be laid from Elsinore to Helsingborg, two English miles, on hollow iron pillars filled with concrete. It is proposed to so balance the weight of the pipe with the displaced mass of water that the pillars will have hardly any burden to carry. The tunnel is to be laid so deep as to be secure from the action of the waves and out of the reach of the biggest ships. One danger will remain, however, against which the skill of the engineers can provide no protection — the peril from a sinking wreck. Should such a one strike the tunnel it would be all up with it, and with anything that happened to be *en route* between the two coasts, in an instant. The cost of the tunnel is put at £800,000.

The Astor Library contains a full set of the patent specifications of this country, and of nearly or quite all European countries in which patents are granted.

Proceedings of the Mechanical Section of the American Association for the Advancement of Science.

WASHINGTON MEETING.

ADDRESS BY PROF. THOMAS GRAY, VICE-PRESIDENT—SCIENTIFIC EDUCATION OF MECHANICAL ENGINEERS.

Professor Gray discussed the various problems of mechanical science, which are at present the basis of the instruction of students in technical schools, pointing out that many of them were ill-fitted to prepare the student for practical work, and that there is room for much improvement in economizing the time of the student by concentrating his attention on more practical exercises, having a direct bearing on the advance of the profession of engineering, while yet of a thoroughly scientific character. A number of specific problems were cited as examples of profitable exercises for students, arising out of the subjects of strength of materials, testing of structures and machines, and the measurement of power by improved methods, largely originating with Prof. Gray, all of which were discussed at length.

MAXIMUM ECONOMY ATTAINABLE BY THE INJECTION OF WATER AS ATOMIZED SPRAY INTO AIR-COMPRESSING CYLINDERS, BY F. T. GAUSE AND A. POST.

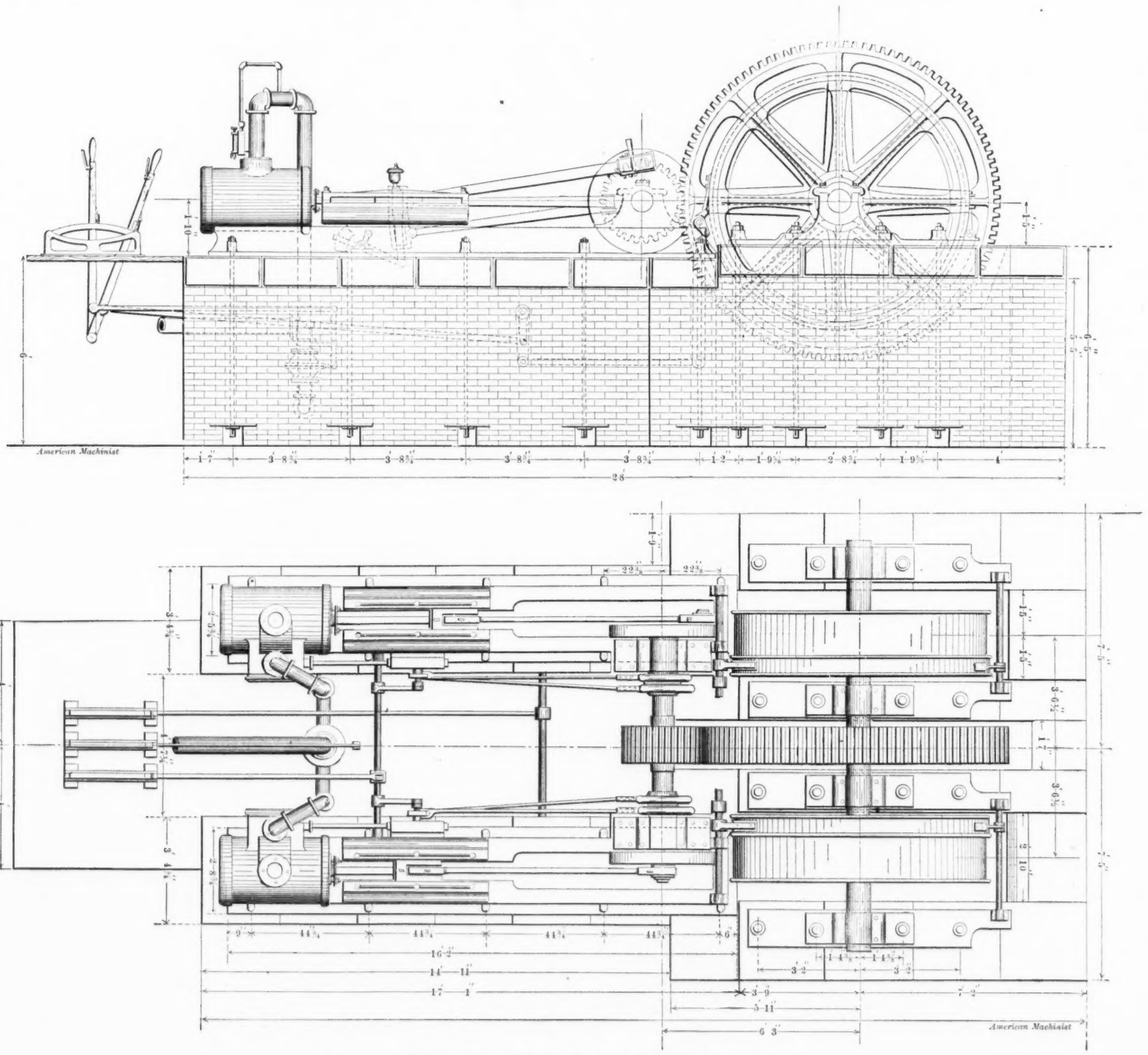
This paper consisted of a report of the results of experiments made on an 8x12 Rand air compressor at the Stevens Institute, Hoboken. In the absence of the writers, it was presented by Prof. J. E. Denton, by means of lantern views of indicator cards given in Figs. 1 to 15. The special object of the experiments was to determine whether any difference in economy resulted from the use of a given amount of injection water introduced into the compressing cylinder, as a solid stream, and as atomized spray, respectively. The experiments, however, covered the use of a water jacket also.

American practice has shown that the use of a solid jet of injection water, forced into the compressing cylinder during compression of the air, results in maintaining the temperature of the air at the outlet from the compressor at about 90° Fahr. for 90 pounds pressure. But indicator cards from such practice fail to establish any sensible saving of power due to the water injected, as the compression curve coincides practically with the adiabatic curve, or the curve which corresponds to the work necessary to be expended in compressing air without any abstraction of heat from the latter. The impression prevails, however, that if the water is injected as an atomized spray instead of as a solid jet, the compression curve would lie nearer to the Marriotte curve, and power be saved, the belief being that the solid jet of water does not begin to absorb the heat in the air until the compression is completed, and the air is being ejected from the compressing cylinder; whereas, the atomized spray is supposed to be able to absorb the heat of the air to a sensible degree during the whole period of compression. Monsieur Colladon used an atomized spray injection in the compressors at the St. Gothard Tunnel, and is credited with having saved power *during* compression; but historians of his practice exhibit no indicator cards, and argue solely from the fact that the outlet temperature of the compressed air was maintained as low as 90° Fahr. It was therefore thought desirable to copy the conditions of Colladon's atomized spray injection, and determine whether it is a fact that the cooling influence of water in this form is superior, from an economical standpoint, to the use of a solid jet.

The arrangements for the experiments were as follows: An 8x12 horizontal air compressor, having a water jacket about the barrel of the cylinder, was fitted with a piston having a cupped leather packing, so as to be perfectly tight as regards leakage. The compressor was run single-acting, so that there would be but one set of inlet and outlet valves to keep in order. The compressed air was delivered into a seamless steel tank of 70 cubic feet capacity, provided with double valves, so that when filled with compressed air the contents could be allowed to cool without any leakage, to a uniform temperature, and thereby the weight of air delivered be determined. The atomized water jet was formed by causing three streams of water about $\frac{1}{64}$ inch diameter to collide with each other as they flowed into the compressing cylinder. The water supplying the jet was drawn from a large tank under 200 pounds pressure per square inch. The highest pressure of air was 100 pounds per square inch. The volume of spray caused by the three jets, when unrestricted, was equivalent to a cone having a base about 20 inches diameter and 30 inches high, as shown by Fig. 15. It is evident, therefore, that, when confined to the volume of the compressing cylinder, the spray permeated the air in as thorough a manner as is probably possible. The quantity of water injected was determined by draining the air as it left the compressor. The delivery pipe was made to drop vertically so as to form a trap, and the water was drawn out steadily during an experiment, the level of the water in the trap being maintained at a fixed point by means of a water glass. What little water was carried over with the air into the receiving tank was drained from the latter after it had stood for several hours, but it was found that the water thus entrained was an insignificant fraction of the total amount used. The experiments were confined to the following conditions:

1. 60 pounds pressure and 60 revolutions per minute.

2. 60 pounds pressure and 100 revolutions per minute.



GEARED HOISTING ENGINES.—SEE PAGE 1.

3. 100 pounds pressure and 60 revolutions per minute.

4. 100 pounds pressure and 100 revolutions per minute.

Some of the average results are shown by the accompanying diagrams, which are selected to cover the use of about the same quantity of water used in the jacket, as a solid jet, and as atomized spray respectively.

Referring to Fig. 1, the outer compression curve *A B* represents the adiabatic curve for dry air, that is, the curve which the compression would cause if all of the heat created accumulated without loss. The curve *A C* represents the Marriotte curve, which would be formed with dry air if heat was abstracted so thoroughly that the temperature did not rise above that of the atmosphere. The actual curve must

lie between these two. The nearer the actual curve approaches the curve *A C*, the less the expense of power to compress the air, and for about the pressures used the possible saving by cooling would be 25 per cent. of the power corresponding to a compression curve like *A B*. To define the location of the actual curve, there is given the value of exponent n in the formula

$$p\,v^n = \text{constant},$$

which would fit the actual curve. If n has a value of 1, the curve is *A C;* if n has a value of $1\frac{4}{10}$, the curve is *A B*. The saving of power corresponding to intermediate curves is about as follows:

Value of Exponent n.	Work of Compression. That for *A C* being unity.
1.4	1.0
1.35	0.977
1 3	0 938
1.25	0.915
1.2	0.886
1.15	0.850
1.0	0.750

The data is as yet not entirely analyzed, but the principal results for the conditions shown by the cards may be summarized as shown in table below:

It is evident from these results that the spray reduces the exponent of the compression curve to a very sensible extent, and enables about one-third of the possible saving corresponding to the Marriotte curve to be realized. The figures also confirm the general result of previous experiments made on compressors in service, but under less favorable circumstances for accuracy; namely, that a solid jet, while reducing the temperature to practically the same level as the spray, does not appreciably save power more than does a jacket, which permits the outlet temperature to remain 200 or more degrees higher. It is also evident that indicator cards taken in practical service may have an accidental variation of exponent amounting to at least 0.03, a fact which explains how many cards in existence apparently show no saving in compression between a solid jet and a jacket, since such saving is evidently confined to about 0.02 units in the exponent value, or to about 4 per cent. of the adiabatic work. It is not probable that so perfect an arrangement of spray as here used could be maintained in practice. Also, experience has shown that cylinders are liable to serious deterioration by the injection of water not perfectly free of all sediment. Consequently the use of a jacket, which will maintain the cylinder walls cool enough for good lubrication purposes, but which is not intended to effect any saving of power, represents the most sensible, and, on the whole, the best practicable plan for pressures not exceeding 100 pounds.

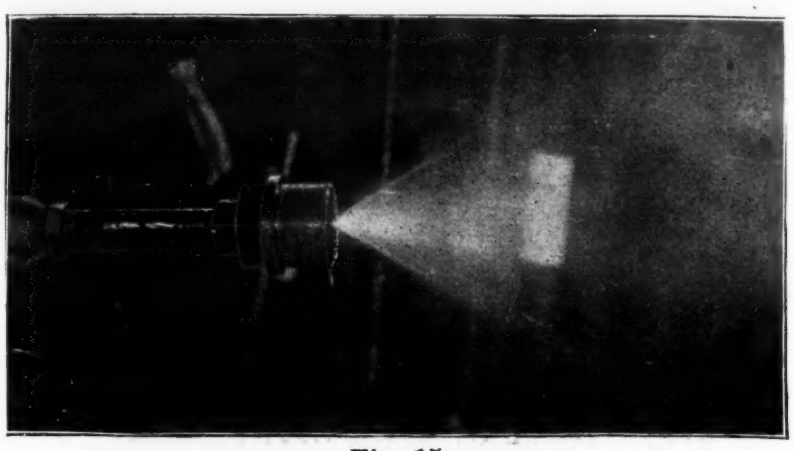
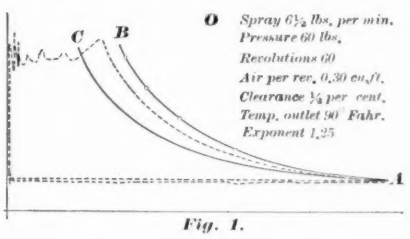


Fig. 15.

Test No. 4 compared with No. 3, and No. 8 with No. 7, and No. 12 with No. 11, taking into account accidental errors in the exponent, show that large variations in the amount of water circulated through the jacket, cause no important changes in the temperature or economy. Variations of speed, however, in the case of the jacket, greatly influence the temperature of the outlet air without any variation of pressure. The amount of injection water used by Colladon at the St. Gothard Tunnel corresponds to about $3\frac{1}{4}$ pounds per minute for 60 revolutions. Hence the economy here shown with $6\frac{1}{2}$ pounds of water is probably superior to that obtained by Colladon. The delivery of air shown in Column 3 averages about 6 per cent. less than the piston displacement, corrected for clearance and imperfect admission, in the case of the jet and spray, and about 8 per cent. in the case of the jacket. The expansion of the air in the clearance spaces is shown, by the cards, to be annulled in the case of the spray and jet. Increasing the clearance space, as shown in Card, Fig. 12, sensibly influences the clearance expansion line, but the delivery of air is the same per cent. of piston displacement as for the smaller amount of clearance. Cards, Figs. 13 and 14, show the effect of considerable piston leakage. It will be observed that the vertical line at the end of the ejection inclines to the vertical, so as to be nearest to the latter at the bottom. This is caused by piston leakage, so that at the end of the stroke, instead of the clearance spaces remaining filled with air, at high pressure, until the piston recedes, they emptied themselves, so as to allow the pressure to be reduced by leakage *before* the completion of the ejection stroke. The result is, that the delivery of air is only 0.22 cubic feet per revolution, which is about 30 per cent. less than the piston displacement. The exponent of the curve is also about 0.05 units lower than it should be. The manner of testing leakage was as follows. After each experiment the compressor was stopped, and the fall of pressure in the piping leading to the receiving tank determined without closing any valves between the tank end of the pipe and the compressor. Such fall of pressure represented the leakage of the outlet valves of the compressor.

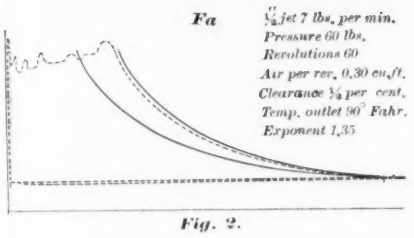
In all of the tests accepted as correct, the greatest fall of pressure ascribable to the leakage of the outlet valves was about 10 pounds in 10 minutes, which was thought to represent the best possible result, as the valves were carefully ground to their seats until by repeated trials further improvement was impracticable. To test the leakage of the piston and inlet valves, the compressor was turned over by hand through a fraction of a stroke, so as to create a pressure equal to about the maximum used, and then the piston was blocked, and the fall of pressure noted per unit of time with a valve closed on the outlet pipe. In the case of the test affording cards in Figs. 13 and 14 the pressure fell so rapidly that it was all lost in a few seconds. But in the case of all the other cards about three minutes were required to cause a loss of 30 pounds. This amount of leakage represents a loss of about one hundredth of a cubic foot per minute, which was an insignificant factor, as the average amount of air compressed at atmospheric pressure at the lowest revolution was about 20 cubic feet per minute.

The total area of opening of the outlet valves was $1\frac{1}{2}$ per cent. of the piston area, and that of the inlet valves 6 per cent. Only two out of the four inlet valves were used, one being removed to make the indicator connection, and another to connect the water jet. The measurements do not depend upon the proportion of valve opening, as they are based upon the actual pressures in the cylinder which are given by the indicator cards.



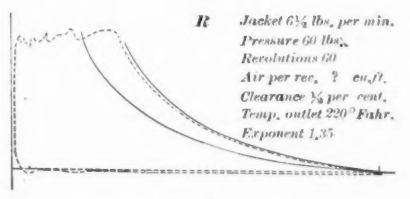
O *Spray 6½ lbs. per min. Pressure 60 lbs. Revolutions 60 Air per rev. 0.30 cu.ft. Clearance ⅛ per cent. Temp. outlet 90° Fahr. Exponent 1.25*

Fig. 1.



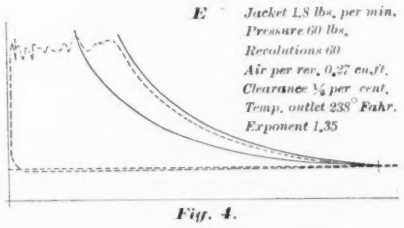
Fa *½" jet 7 lbs. per min. Pressure 60 lbs. Revolutions 60 Air per rev. 0.30 cu.ft. Clearance ⅛ per cent. Temp. outlet 90° Fahr. Exponent 1.35*

Fig. 2.



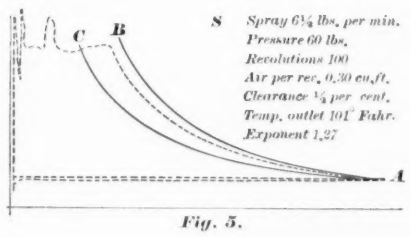
R *Jacket 6¼ lbs. per min. Pressure 60 lbs. Revolutions 60 Air per rev. ? cu.ft. Clearance ⅛ per cent. Temp. outlet 220° Fahr. Exponent 1.35*

Fig. 3.



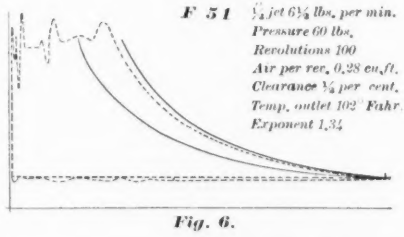
E *Jacket 1.8 lbs. per min. Pressure 60 lbs. Revolutions 60 Air per rev. 0.27 cu.ft. Clearance ⅛ per cent. Temp. outlet 238° Fahr. Exponent 1.35*

Fig. 4.



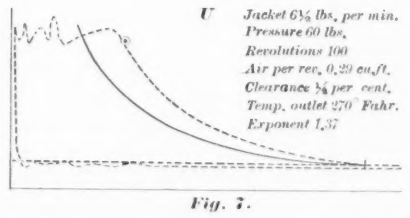
S *Spray 6¼ lbs. per min. Pressure 60 lbs. Revolutions 100 Air per rev. 0.30 cu.ft. Clearance ⅛ per cent. Temp. outlet 101° Fahr. Exponent 1.27*

Fig. 5.



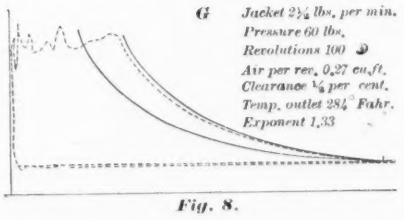
F 51 *½" jet 6½ lbs. per min. Pressure 60 lbs. Revolutions 100 Air per rev. 0.28 cu.ft. Clearance ⅛ per cent. Temp. outlet 102° Fahr. Exponent 1.34*

Fig. 6.



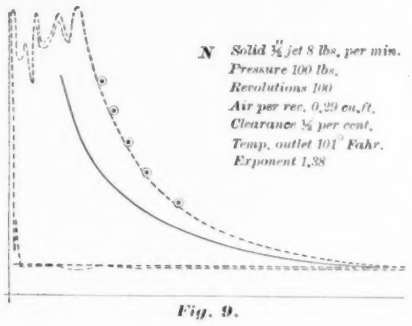
U *Jacket 6½ lbs. per min. Pressure 60 lbs. Revolutions 100 Air per rev. 0.29 cu.ft. Clearance ⅛ per cent. Temp. outlet 270° Fahr. Exponent 1.37*

Fig. 7.



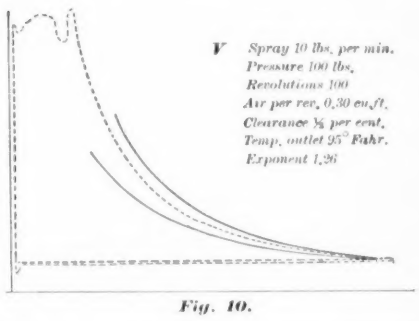
G *Jacket 2½ lbs. per min. Pressure 60 lbs. Revolutions 100 Air per rev. 0.27 cu.ft. Clearance ⅛ per cent. Temp. outlet 284° Fahr. Exponent 1.33*

Fig. 8.



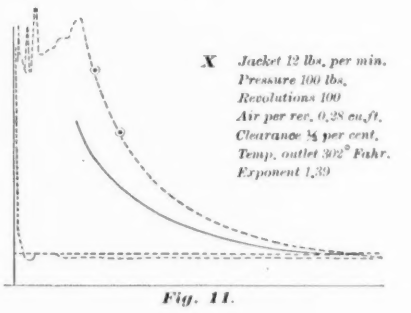
N *Solid ½" jet 8 lbs. per min. Pressure 100 lbs. Revolutions 100 Air per rev. 0.29 cu.ft. Clearance ⅛ per cent. Temp. outlet 101° Fahr. Exponent 1.38*

Fig. 9.



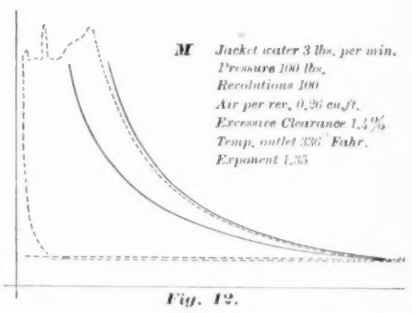
V *Spray 10 lbs. per min. Pressure 100 lbs. Revolutions 100 Air per rev. 0.30 cu.ft. Clearance ⅛ per cent. Temp. outlet 95° Fahr. Exponent 1.26*

Fig. 10.



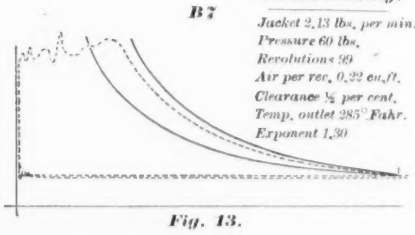
X *Jacket 12 lbs. per min. Pressure 100 lbs. Revolutions 100 Air per rev. 0.28 cu.ft. Clearance ⅛ per cent. Temp. outlet 302° Fahr. Exponent 1.39*

Fig. 11.



M *Jacket water 3 lbs. per min. Pressure 100 lbs. Revolutions 100 Air per rev. 0.26 cu.ft. Excessive Clearance 1.4% Temp. outlet 336° Fahr. Exponent 1.35*

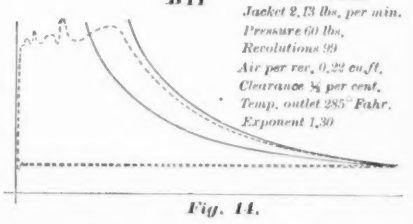
Fig. 12.



Preliminary run Piston leaking.

B7 *Jacket 2.13 lbs. per min. Pressure 60 lbs. Revolutions 99 Air per rev. 0.22 cu.ft. Clearance ⅛ per cent. Temp. outlet 285° Fahr. Exponent 1.30*

Fig. 13.



Preliminary run Piston leaking.

B11 *Jacket 2.13 lbs. per min. Pressure 60 lbs. Revolutions 99 Air per rev. 0.22 cu.ft. Clearance ⅛ per cent. Temp. outlet 285° Fahr. Exponent 1.30*

Fig. 14.

No. of Card Fig.	Pressure.	Revolutions.	Cubic feet air delivery at atmospheric pressure and temperature, 70° Fahr.	Clearance per cent. of piston displacement	Temperature air at outlet Fahr.	Pounds of cooling water per minute.	Exponent of curve.		Saving of compression work in per cent. of possible theoretical saving, by perfect cooling during compression.
1	60	60	0.3 per rev.	½%	90°	6½	*S	1 25	33%
2	60	60	0 3 "	⅛%	90°	"	Jt	1 35	8%
3	60	60		⅛%	220°	6½	J	1 35	8%
4	60	60	0 27 "	⅛%	238°	1.8	J	1 35	8%
5	60	100	0.3 "	½%	161°	6½	S	1.27	30%
6	60	100	0.28 "	½%	102°	6½	Jt	1 34	10%
7	60	100	0.29 "	½%	270°	6½	J	1.37	5%
8	60	100	0 27 "	⅛%	284°	2½	J	1.33	14%
9	100	100	0 29 "	⅛%	101°	8	Jt	1.38	3%
10	100	100	0.3 "	½%	95°	10	S	1.26	32%
11	100	100	0.28 "	½%	302°	12	J	1.39	2%
12	100	100	0.26 "	1 4	336°	3	J	1.35	8%

*S = Spray.
Jt = Solid Jet.
J = Jacket.

ON THE VALUE OF CARBONIC ACID AS A REFRIGERATING AGENT, BY PROF. D. S. JACOBUS.

Carbonic acid is now employed to a limited extent in the production of artificial cold. The following theoretical comparison of its economy with that of ammonia, which has been abstracted from work done in preparing a revision of Ledoux's work on Ice-Making Machines, may therefore be of interest.

The ordinary temperatures of the condensers of ice-making machines are but slightly lower than the critical temperature of carbonic acid, so that its properties as a refrigerating agent lie between those of a vapor that is not brought near to its critical temperature, such as ammonia, and a gas that is not liquefied, such as air.

In the case of air no cooling is produced by simply passing it at a high pressure through an orifice, so that an expansion cylinder must be employed to produce a refrigerating effect. In the case of ammonia,

the presence of an expansion cylinder has but little influence on the economy, the theoretical amount of saving effected thereby, when friction is disregarded, being only about seven per cent. This figure will be still further reduced if the effect of friction is included.

The economy of carbonic acid is greatly reduced if the expansion cylinder is dispensed with, and the condensed gas allowed to flow through a throttling cock, the loss being about 33 per cent.

All machines, except those using air, dispense with the expansion cylinder, so that, in the following comparison between carbonic acid and ammonia, the liquid is assumed to be expanded through a simple cock. Allowance is made in the calculation for the superheating that the gas experiences during compression, and the friction is taken at 15 per cent. of the net work of compression.

Substance.	Condenser.		Refrigerating Coils.	
	Temperature in degrees Fahr.	Absolute pressure in lbs. per sq. inch.	Temperature in degrees Fahr.	Absolute pressure in lbs. per sq. inch.
Ammonia..	64.4	117.5	5	33.7
Carbonic Acid.	64.4	826.0	5	342.0
Ammonia..	64.4	117.5	−22	16.9
Carbonic Acid. ...	64.4	826.0	−22	210 0

Substance.	Ice-melting capacity in tons per cubic ft. of piston displacement.	Lbs. of ice-melting capacity per lb. of coal, assuming 3 lbs. of coal per hour per indicated horse-power.	Gallons of condensing water per ton, assuming 30 degrees range of temperature in condensing water.
Ammonia.....	.00022	35 6	1310
Carbonic Acid.	.00088	24.1	1380
Ammonia.....	.00011	21 6	1410
Carbonic Acid.	.00051	13 8	1570

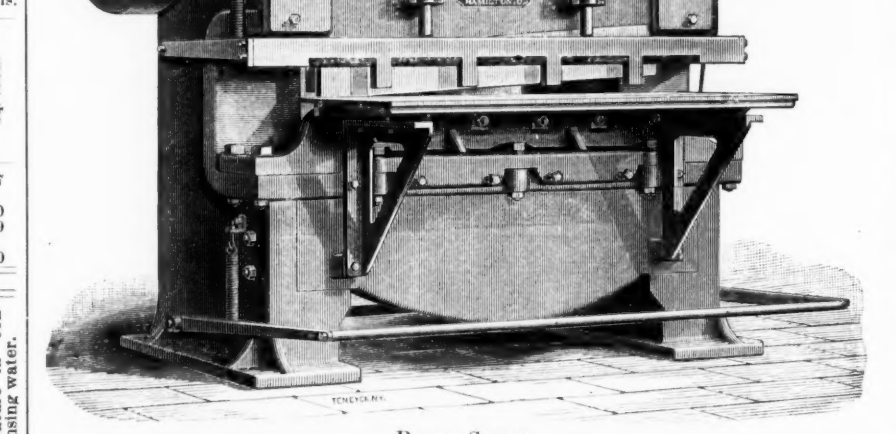
A study of the table will make it evident that, while the greater density of carbonic acid vapor permits the compressing cylinder to be only about one-fourth the capacity necessary with ammonia per ton of refrigerating effect, the pressures to be controlled are as high as 800 pounds per square inch, instead of about 120 pounds with ammonia. As regards compactness or size of compressing cylinder, it offers the same advantage relatively to ammonia that the latter substance does with respect to sulphur dioxide. But the economy of working ammonia is about equal to that of sulphur dioxide, so that the advantage of the smaller compressing cylinder can be set against the disadvantage of the higher pressures to be controlled with ammonia. But in the case of carbonic acid, not only must enormously greater pressures be controlled, but the economy, or the pounds of ice effect per pound of coal, is 50 per cent. less than that of ammonia. There seems to be no ground, therefore, for seeking the use of carbonic acid gas as an improvement upon ammonia.

(*To be Continued.*)

Mechanical Draught System and Economizer.

We present herewith an engraving showing the arrangement of system put into the plant of Messrs. Wallace & Sons, at Ansonia, Conn., by Mr. Gardner C. Hawkins, 8 Oliver street, Boston. The device is known as the Lowcock-Hawkins Economizer, and its object is to abstract from the products of combustion, just before they enter the chimney, all heat above 200° Fahr. Since this low temperature would prevent a chimney working properly, an exhaust fan is put in as shown, the result in many cases being a decided gain in economy.

The philosophy of its action may be explained in the following manner: The temperature of steam at 100 pounds pressure being 338°, it is hardly possible to prevent the gases escaping to the chimney at less than 100° higher than this point, say 438°. At 125 pounds pressure, which is the usual pressure with compound engines, the temperature of the steam is 353°, and at 150 pounds, which is being adopted in many cases on compound and triple engines, the temperature of the steam is 366°. In the case of 125 pounds pressure the gases usually escape at 500°, and in most cases where it is desired to get the best results on combustion of fuel, it is safe to say the gases will escape *above* 500°. By using an economizer placed between the boilers and an ordinary chimney these gases can be cooled 200°, and not damage the working of the chimney if it is properly constructed, this heat being supplied to the feed water. But as the satisfactory working of a chimney depends upon the temperature of the gases entering it, and it was desirable to cool them in some cases below the point at which a chimney will work satisfactorily, the chimney is dispensed with and the fan substituted, this being arranged so that the gases do not interfere with its bearings, and it is found to run with very little expenditure of power, that in the 1,000 H. P. plant shown being operated by about 2 H. P., and the reduction of temperature of the gases with corresponding increase of temperature of water entering the boilers results in very marked economy.



MECHANICAL DRAUGHT SYSTEM.

The Austrian Government has given orders to expel from all universities, and other public educational institutions, any students or teachers who attend, or speak at, the meetings of organized workmen.

Plate Shear.

We give on this page an illustration of a machine recently brought out by the Long & Allstatter Co., of Hamilton, Ohio, which is designed for the shearing of heavy plates, such as used in boilers, ships, bridges or structures of iron or steel.

This is a table machine with an overhang to the shear blades, and is adapted for splitting sheets or for cross cutting. The illustration clearly shows the general construction of the machine, which, as will be noticed, is very heavily proportioned and powerfully geared.

PLATE SHEAR.

The cam shaft is of steel, running in bushed bearings, and the connections between the cams and the slide are also of steel, bushed with gun metal. The shear blades are reversible, each having two cutting edges.

The machine has an automatic hold-down to pinch the plate while it is being sheared, and has also an automatic stop mechanism which brings the shear to rest at any desired point of stroke. As shown in the illustration, the machine is arranged for being driven by belt, but is built with self-contained steam engine attached when this is desired.

These machines are built in various sizes, our illustration being taken from a machine adapted for shearing steel up to one inch thick, and to cross-shear plates ten feet wide and under. The depth of throat or overhang of the shear blades varies in different sizes from six inches to thirty-six inches, the greater overhang, of course, requiring very much greater weight in the machine. A machine with a thirty-six-inch throat will split thirty-six inches from the edge of a sheet of any length.

Look to Your Flasks.

The following information from Mr. Thomas Keenan, foreman of the Bagley & Sewell foundry, Watertown, N. Y., may prevent loss and annoyance to others engaged on this class of work. They had a large number of plates 14 inches x 7 inches x 3-16 of an inch to cast for sewing machines. At first it seemed impossible to cast these plates straight; they would be sprung and found to be thick on opposite corners, so that to plane a level surface on them for the face side of the sewing machine two corners of the plate would be planed almost to a feather edge. Of course all such castings were condemned before going to the machine shop.

Mr. Keenan says they tried shaking out hot, turning them up on their edge, stacking them up as soon after they were poured as possible in a rack, twenty-five feet deep, and putting a heavy weight on top of them, leaving them in the molds all night; but the result was the same in every instance. This annoyed and worried him so he would wake up through the night and try and think of some remedy. The plates were made in a snap flask, and one night the idea occurred to him that the flask might not be true on top. On examining the flask the next morning he found it worn away on two corners, and when the weight was put on the mold to pour it off it did not touch the mold at the corners where the casting showed the thickest. The result was, when pouring the molds the pressure of iron would force the sand up to the weight at these corners, and, while the strain was enough to make the casting unequal, it was not enough to "run out," or no doubt Mr. Keenan would have found the remedy sooner. A new iron-bound snap flask was made, and there was not one bad casting from that cause out of thousands that they made. The essential point in pouring snap flask work of this kind is to have the mold set level and a weight heavy enough to sustain the pressure bearing even over the top of the mold.—*Journal of the Brotherhood of Machinery Molders.*

It is pretty well settled that a bridge will be built across the Hudson River, connecting New York and New Jersey. This is a great undertaking, and will, if carried out on the plans at present contemplated, greatly increase the mail facilities between New York and the trains arriving and departing from the Jersey shore.

All over the world there is agitation about railroad accidents; but considering the great number of passengers carried by railroads, the loss of life is surprisingly low.

A British gunboat in her recent gun practice sunk two fishing boats. Of course it was all an accident.

A New Turret Drill Press.

The accompanying engravings give perspective and detail views of a new drill press intended for manufacturing purposes, which embodies several new features worthy of attention.

On a cabinet base—which is one-third the total height of the machine—is mounted a column, at the top of which is the mechanism for driving the spindles; there being six of these, any one of which may be brought into position to operate by revolving the turret in which they are placed, and the arrangement is such that only the spindle which is in use is in motion.

The arrangement of the mechanism is made clear by the perspective engravings, which give two views of it, and the detail views, showing the internal arrangements. The cone pulley at the side of the head is on a short shaft, at the other end of which there is a bevel gear made of rawhide, with the object of securing absolutely quiet running. This rawhide gear engages with two other gears, which, of course, thus revolve in opposite directions. One of these is on a shaft which passes through to the front of the turret, and carries the bevel friction wheel *C*. The other gear is on the end of a sleeve, the other end of which carries the bevel friction wheel *B*, these two disks revolving in opposite directions in contact with the smaller bevel wheels *A*, which are placed on the ends of the spindles.

One effect of this arrangement is to very much increase the driving power, and also to relieve the spindles from side pressure due to the friction wheels, since the pressure is balanced from opposite sides, and all the pressure brought upon the friction wheels is made use of in driving the spindles.

The turret revolves upon a trunnion which is independent of the shaft bearings, and eccentric to it, its center being sufficiently above that of the shafts on which the bevel driving wheels are placed to disconnect from the larger wheels, all but the wheel which is on the spindle that is in position for work, and all others do not revolve except as they are successively brought into position to operate. The boxes in which the spindles run are threaded near the lower ends, as shown, and provided with a check nut or ring, by means of which they may be adjusted radially to bring more or less pressure on the friction wheels, and by this means it is practicable to so adjust the friction for any spindle doing light work where there is danger of breaking the drill or other tool, that it will just drive it when working properly, but slip if any unusual obstacle is encountered.

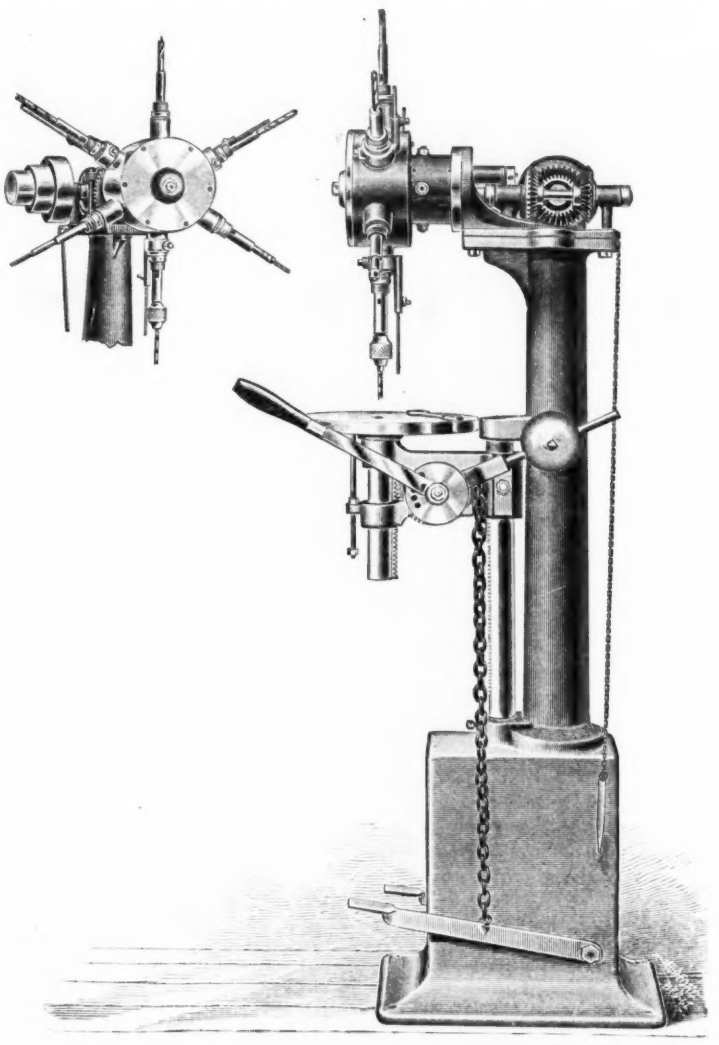
A stop pin holds the turret in proper position, this pin being withdrawn by means of the foot treadle at the left of the machine, which is connected by the light rod to a bell crank seen at the rear of the turret, this crank being connected to the stop pin, which is of hardened steel ground true, and engages in hardened and ground bushings fixed in the turret. The turret locks itself in position automatically.

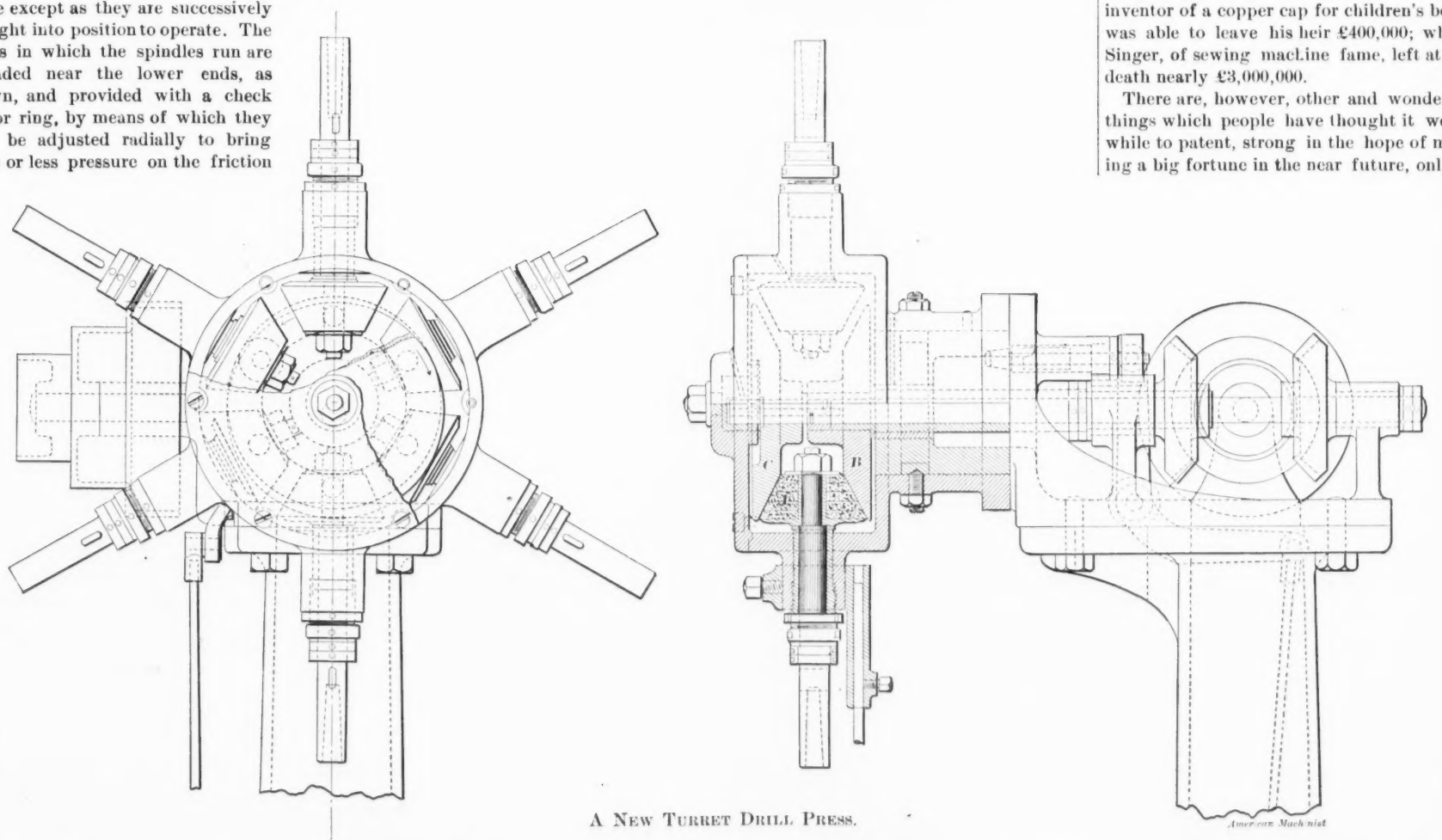
Both horizontal shafts are provided with means of endwise adjustment by which the larger friction wheels are placed and kept in proper position.

The feed is either by hand or foot treadle, as shown, the table being provided with a threaded rod with nuts for stops to limit its motion. An adjustable stop is also provided, which may be used on any spindle, and which, coming in contact with the work, the fixture in which it is held or the drill table, gauges the depth of the drilling.

Among the advantages of the machine are that several drills, reamers, or counterbores, may be fixed in their respective spindles, each with an independent stop which may be adjusted for various depths, and all brought to the center of the table and in position for work, without stopping the machine or moving the work. All tools or spindles not in use are up out of the way, and do not interfere with work of any size or character.

The speed for different sizes of tools may be changed by the operator very quickly without leaving his position, the range of speeds being from 250 to 2,000 revolutions per minute.





A NEW TURRET DRILL PRESS.

The machine is, of course, well adapted for small jig drilling where several holes of different sizes and depths are required in the same piece. Also for drilling and reaming or tapping without removing the work from the table.

So far as we are aware, this is the only tool, making use of the turret principle, in which the drills revolve, all others with which we are acquainted holding the tool stationary while the work revolves.

The capacity of the machine illustrated is to drill from the smallest holes up to $\frac{1}{2}''$; distance from face of column to drill, 10″. All bearings are lined with bronze bushings, the quality of the workmanship being sufficiently guaranteed by the fact that it is built by the Colts Pat. Fire Arms Co., of Hartford, Conn., with special tools and appliances made for the purpose. The machine is the invention of Mr. A. D. Quint, of Hartford, and the first one built has been in use at Colts' armory for some months, giving excellent satisfaction. Its weight complete, ready for shipment, is 430 pounds.

Some Curious Inventions.

The history and growth of inventions are subjects in which all are interested. The difficulties and rebuffs which inventors have had to undergo in the perfecting of their ideas, their perseverance and ultimate success, form most interesting reading.

Vast sums of money are brought in by apparently simple inventions requiring no great mechanical knowledge. The accounts of these read more like the wildest fiction than simple fact, and are sufficient to make the least covetous among us yellow with jealousy. The stylographic pen brought in £40,000 a year; the india rubber tips to pencils £20,000; metal plates for protecting the soles and heels of boots brought in £250,000 in all; the roller skate £200,000. A clergyman realized £400 a week by the invention of a toy; another toy, the return ball (a wooden ball with a piece of elastic attached) brought in an annual income of £10,000; the "Dancing Jim Crow" £15,000 a year. The inventor of a copper cap for children's boots was able to leave his heir £400,000; whilst Singer, of sewing machine fame, left at his death nearly £3,000,000.

There are, however, other and wonderful things which people have thought it worth while to patent, strong in the hope of making a big fortune in the near future, only to find in so many cases that their inventions were impracticable and very often perfectly ridiculous.

Among such may be mentioned a child's bib with a trough attached, the whole formed of some waterproof material, a pocket which cannot be picked, a muff and boa filled with air to save you from a watery grave; cuffs and collars made of steel,

painted or enameled white; trousers with double legs—on the outer legs getting soiled or bespattered you tuck them up, and behold a clean pair. This arrangement would be suitable, I should say, only when worn with an overcoat.

Under the head of umbrellas and walking sticks we find some marvelous inventions.

One is an umbrella which in some wonderful way is converted into a walking stick, and so formed that a spear can be attached, when it is used as a weapon of offense and defense. I recommend it to elderly ladies in the dog-days, as a protection against the sun and mad dogs.

The next invention is a rain absorber, to prevent rain from running down hats and umbrellas. The absorber is formed either of uncovered sponges or of sponges covered by a fabric. We are told that the absorber can be readily removed from the article, squeezed and replaced.

We come next to an article which the inventor has named (take a long breath and shut your eyes) the "Rhabdoskidophorus." This is an umbrella which can be taken apart, the silk and ribs being hidden within the stick; it is thus transformed into a stout walking stick.—*Strand Magazine.*

The Polytechnic Institution, Regent street, London, intends to conduct a series of excursion tours to the World's Fair for the accommodation of people in moderate circumstances. It has now contracted with the Inman Steamship Company, which owns the "City of Paris," "City of New York," and other fast steamers, to transport parties weekly. It is planned that each party will spend two days in New York, visit Philadelphia and Washington, stay a week in Chicago, and return to New York by way of Niagara Falls and the Hudson River. The tour will occupy about a month and cost not to exceed 25 guineas, or about $128. It is reported that already nearly half the memberships have been taken.

If something similar could be done in this country at a proportionate expense many people would be able to attend that cannot do so otherwise, and these people would be largely those who, by reason of having few opportunities for traveling about to see what the world is doing, would be most benefited by the educational influence of the Fair.

The public school system in general operation in this country is the best in the world. But unfortunately it is a creation of State laws. Hence wise people shun those States where the laws are not favorable in this respect.

LETTERS FROM PRACTICAL MEN.

A Comprehensive Drill Pad.

Editor American Machinist:

Nearly every machinist has, at times, occasion to execute work in his lathe that ought to be done on a drill press, and if the hole he is drilling goes all the way through, he wants an unoccupied space for his drill to enter after it has gone through the work. If the drill pad, or drill plate, as it is sometimes called, has a hole in it, it is generally of the wrong size—either so small the drill will not enter, or so large that, in drilling near the edge of a small piece, the latter will tip up and cause the hole to be out of square. At least this has been my experience on numerous occasions; and after resorting to various expedients, such as holding a ring between the drill pad and work, or, a parallel with a hole in it, or the still more difficult feat of trying to hold up two equal parallels in such a position that the drill would pass between them, I determined to have a drill pad that would cover all ordinary requirements as to size of hole, so I made one like the sketch herewith, modeled after the little diaphragm sometimes seen under microscope stages; that is, a revolving plate with several different sized holes in it, any one of which may be brought in line with the lathe spindle, according to the requirements of the job in hand. As shown by the sectional view, there is a casting *A* which has a steel stem *B* driven tight in one hole, the other hole receiving the stem *C* of the revolving plate. Stem *C* is slightly longer than the hole in which it revolves, so when the washer is screwed up tight against the end of stem, the latter can turn with a slight frictional resistance. I have used a countersunk screw to fasten on this washer, which looks quite as well in this instance, and hasn't so many internal corners to collect dirt, nor so many external corners to bark knuckles, as the hexagon-headed screw that Mr. Booth would seem to prefer. The index pin with spiral spring around it engages with the small holes drilled in back of plate, to hold any of the assorted sized holes in line with the lathe spindle. If the hole in plate we are using is larger than the drill, and we are drilling very close to the edge of the work, the plate hole may be left off center enough so the drill will just clear the side of it, in which case the index pin will stand between two of its holes, and will not enter; but the washer has friction enough to hold the plate steady.

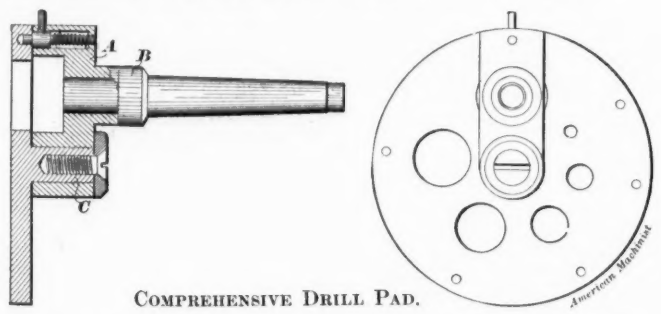
Of course it isn't necessary that there should be *exactly* the same amount of stock between the holes in order that this rig should be a success as a drill pad; yet any one who is fond of mathematics will find it a nice little problem to so lay out the holes that the same thickness of material is left between them. The holes in my plate are $\frac{1}{8}''$, $\frac{1}{4}''$, $\frac{3}{8}''$, $\frac{1}{2}''$, $\frac{5}{8}''$ and $\frac{3}{4}''$, the center of each being $\frac{3}{4}''$ from center of revolving plate.

WALTER GRIBBEN.

The Utilization of Smoke.

Editor American Machinist:

The self-consumption of smoke by factory and locomotive chimneys is a problem which has long been demanded in the interests of hygiene and industry, but which has not yet met with a practical solution.



COMPREHENSIVE DRILL PAD.

At a recent meeting in England, at which the question of lighting by gas was considered (a condensed report of which was submitted to the *Genie Civil* by Mr. Bellet) Mr. Vivian B. Lewis showed that smoke, which both poisons and obscures the atmosphere of our towns, may be considered as a valuable product.

It is well known that the residual products of our gas works are of such value that it would be often advantageous to manufacture gas, which itself would not be employed, in order to obtain these residual products, which were formerly looked upon as a great source of inconvenience and expense for the manufacturers. The same may now be also said of the smoke of our factories.

An English company, the Furnace Gas Co., pays a considerable annual sum to three or four metallurgical concerns in Scotland for the right to collect the smoke and the gases of their furnaces. The gas and smoke are condensed while passing through tubes of considerable length, and yield, during the process of cooling, certain compound oils which are found to be of great industrial value. In one of these establishments at Glasgow, the company collects 30,000 gallons per week of this product. The oil thus obtained is purified and treated in the following manner by Mr. Staveley, at Baghill, near Pontefract, Yorkshire. It is first distilled in order to separate from it the 30 to 35 per cent. of water which it contains, while a second condensation causes it to deposit paraffine, a considerable quantity of creosote, a little phenol, and ten per cent. of pyridine. The oil thus purified may then be used for saturating wooden railway sleepers; it can also be used, according to Mr. Lewis, for enhancing the value of common gas, whose lighting power becomes considerably increased, or it may be burnt directly in lucigen or other similar lamps.

This remunerative use of the products of smoke will probably give rise to its being eventually collected at the chimney tops, instead of being consumed as produced, thus largely increasing the cleanliness and comfort of our manufacturing towns, and greatly improving the health of their inhabitants.

WM. COX.

A Job of Boring.

Editor American Machinist:

I remember when I was an apprentice that I had one time a job to bore a long brass sleeve, which was to be forced upon a steamboat propeller shaft.

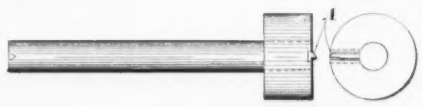
This sleeve was about 14″ long and about 3½″ diameter of bore. I had bored one of this size before, on a large lathe, by holding one end in a chuck and running the other end in a back rest, and using an inside tool in the usual way; but this time I could not get the large lathe, for it was in use, so was obliged to get along with the next best. I could have fastened this to the carriage and bored it with a regular boring bar on two centers, but I thought I could do the job quicker by the way I did before, so I tried it. I found that the lathe was so shaky that it was almost impossible to do it there in that way, so it seemed to me at first that the only thing to do was to take it out of the chuck and clamp it to the carriage. I did not want to do this, so tried to think of some other way.

I got an idea, and after making sure that the "boss" was not likely to come around soon, I set about to try it.

I found an old shaft collar that would true up on the outside the size of the finished hole wanted, and fitted, and drove it upon the end of an old piece of shafting, which, by the way, was one of our arbors; after which I turned it to the size of the finished hole wanted. I then inserted a cutter in the front face, as shown at *A*, by chipping a dovetailed slot, as shown. I adjusted this cutter so that it would cut a good snug running fit for the collar behind it.

I bored the hole to size with a short, stiff boring tool, for about 2″ deep, to fit the collar on my boring head. I then pushed it clean through with the foot-stock.

It made a very fair job for the purpose, and under the conditions I believe it was the best thing to do. Of course all chips and dirt were pushed ahead of the boring head. I was being watched during this work by a fellow on the next lathe—one of these "*I*



told you so" sort of fellows. He did not say a word while I was getting ready, but when I first started the head into the hole I did not have the cutter set out enough, so the head stuck. He said, "I told you so," and seemed to be very much pleased about it; but when I set the cutter out right, and got it well started, he seemed to have a case of the blues, or a bad headache, for he did not appear to be half so observing.

A MECHANIC.

Castings for the St. Clair Tunnel.

Editor American Machinist.

In a recent copy of your paper we notice a request for information as to where the castings for the St. Clair Tunnel were obtained. We would say that these lining castings, which are made in sections of 14 pieces per circumference in lengths of 18¼″, with a weight of about 1,050 lbs. each, were cast two-thirds of them at the Michigan Car Works in Detroit, and the other third at the Grand Trunk R. R. Shops, in Hamilton, Ontario. We assume that it is the lining which is referred to. The hydraulic work, consisting of cylinders, rams, valves, etc., we furnished. We should be pleased to send descriptive circular, as per inclosed, which we send to parties asking for it.

WATSON & STILLMAN,
204–210 East 43d St., New York.

Banking a Cupola.

Editor American Machinist:

On the 30th of Oct., just as we were about putting on the blast, an accident occurred in the breaking of the main pulley, which it was impossible to repair in time for casting. I delayed matters until I saw that nothing could be done that day. The furnace is lighted about 2 P. M.; blast on usually at 4. I waited until six o'clock; the first thought was, drop the bottom; but in my imagination I saw so much unpleasant work in getting out the hot metal and going over the same work again, that I decided to risk banking the cupola, so I proceeded in the following manner: I had my men get old molding sand—would have preferred ashes, but they were not handy—and, as it was getting late, and the fire had been burning for four hours, we therefore had to hurry some, to prevent the fuel being too nearly burned out. My first operation was to clean the tuyeres, and put in pieces of coke same distance, and close together; then I had the tuyeres packed with the old sand—there were six tuyeres—after which we closed the doors and blast gauge. I then had the men treat the top of charges in cupola in a similar manner, but instead of sand I put on fine coal and coke dust—about two feet thick—on top of iron, and kept the door open. The reason I put on coal dust was that, if we could not get out all of the dust, it would not matter much, as the remaining dust would burn; and in that state I left things for the night, and provided for the men, being on hand at seven o'clock the next morning to cast, and the cupola men were requested to be there at six, and to open the tuyeres and clean them, so that they might get rekindled and bright before putting on the blast, have the top of charges cleaned, and, when all was ready, put on the blast at seven o'clock the next morning. In fifteen minutes the first bull was taken out for pouring.

I arranged it so that I could use the first five hundred of metal for heavy work; after that the iron was fit for anything we had. In this heat we had nearly nine tons of metal, the work being about half light and half heavy, the metal of necessity having to be hot and clean.

After running about three-quarters of an hour, I noticed some slag, and allowed the iron to run up, and opened slag hole, after which we run all right, but had to open the tuyeres frequently, to prevent burning. We do a large amount of blower castings, engine castings, which must be bored and turned, and jobbing work that is planed up, light castings similar to stove plate, all of which was in this heat. I make this statement so the reader will understand we do not have all heavy work, for which most any kind of metal will do.

The result of the heat was gratifying. Such a course cannot be pursued with all furnaces, because the tuyeres cannot always be come at. Our furnace is of the Colliau pattern; outside measurement of shell, 60″; inside, when lined, 42″ at bottom and 48″ at melting zone. The blast is supplied by one of our No. 10 steel-pressure solid shell blowers, running at about 1,900 revolutions per minute. I would not advise this treatment in small cupolas. My father having heard me speak of it, thought he would try it, but found his furnace had started to melt, and fire out; the iron became one solid mass, had to be torn down; he had a tough job.

I do not wish to assume all the credit in this matter. While at Stillwater, Minn , in the fall of '79, just as the foreman was about to pull the signal for blast, we were visited with an old-fashioned hail storm, which destroyed all the windows that were in range of the storm. The foundry having a glass roofing, all the broken glass dropped on and into the molds; this lasted about ten to fifteen minutes. Of course we could not cast that day, we had quite enough work to clean up. At first, Mr. Adams, the foreman, thought best to drop the bottom, but some one suggested to bank the cupola, which he did. I being one of the molders at that time, took a hand in helping. We cast the next morning with success. I then said if I get in the same box I will try it also, which I did, with the results stated. I hope this may benefit some, and from my own experience I can safely say it may be done with confidence, and if there is good judgment used. JOHN C. KNOEPPEL,

Buffalo, N. Y. Buffalo Forge Co.

Expansion in Hardening.

Editor American Machinist:

Being a constant reader of your worthy paper, I have noticed a great deal of the use of fire and water on fine steel. I made a die $1\frac{1}{4}$, 10 threads, $2\frac{1}{8}$ outside diameter; the first one was made solid, and, after hardening, I found it had expanded $\frac{1}{1000}$.

The next I made was split, with $\frac{1}{16}$ saw within $\frac{3}{64}$ of going through. I then shrunk a cast-iron collar on the die, heated the whole, and dipped it in strong salt water; taking it out, I found it had cracked where it had been sawed; taking the cast-iron collar off, it expanded $\frac{15}{1000}$.

Can you or one of your readers help me out of this dilemma, by informing me how to prevent this expansion? The die cannot be made any larger in diameter, and I would like to split it so as to make it adjustable, for it must cut an exact size.

A YOUNG MACHINIST.

Core Box System.

Editor American Machinist:

For the benefit of persons running a foundry in connection with a pattern shop, and doing a miscellaneous trade, I submit the following system of sizes of core prints, and record of core boxes:

All core prints from $\frac{3}{4}$" up to 4" should have a tenon turned on of the same size. Cope and drag prints should be made of standard sizes, then if a print gets lost or mislaid, it is easily replaced.

In addition to this, make a record of all the straight core boxes, having a record book lined to suit; in one line give number of pattern; next line length of drag print; next line length between the prints; next line give the length of core print; in another line give shelf number.

Advantages of this record are these: If you are making new patterns requiring core boxes of this character, you will refer to your record book, and see if you have a core box that will suit; or if you are getting out an order for castings requiring different lengths and sizes of cores, you refer to your record book, and find the exact length of core box required, thus saving time, and often saves wearing out files in giving the core the exact shape.

I have used this system for some years, and recommend it for its economy. JOS. F. EMMERT.

In many of the cities adjacent to New York the morning whistle of the steam plant is heard. It sounds its lengthy note from six to seven in the morning, and is what may be called, without stretching a point, an unmitigated nuisance. There is no good reason why a man with a one-dollar clock shall not know when to get up and when to go to his work. The whistle on workshops is one of the things that ought to go.

Cutting a Cam.

BY F. H. TREACY.

As cam cutting is rather an unusual operation in a jobbing shop, a description of one way in which such a job was successfully accomplished may be the means of bringing out the methods of others which are simpler and better.

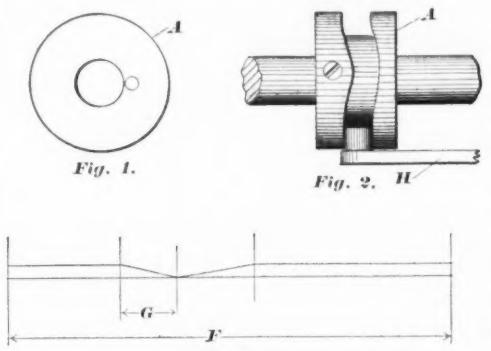


Fig. 1. Fig. 2. Fig. 3. Fig. 4.

CUTTING A CAM.

The cam required is shown in Figs. 1 and 2. The conditions of the case called for a cam which would give a horizontal movement of $\frac{1}{8}$" to a flat bar carrying a roller which ran in the cam groove, this movement to take place while the cam was making $\frac{1}{8}$ of one revolution, and then return to its normal position in a little more than $\frac{1}{8}$ of its revolution, and then remain stationary during the balance of the time. Fig. 2 shows the relative positions of bar *H* and cam *A* when completed and in place. Fig. 3 shows the way in which the lines necessary to make such a movement were laid out. First two parallel lines $\frac{1}{8}$" apart. The length *F* of each being equal to the whole circumference of the cam *A* and the distance *G* being $\frac{1}{8}$ of *F*, a diagonal line drawn between these two points, as shown, gave the angle for the first movement. The return movement was drawn in the same manner, with the exception of its being lengthened out about $\frac{1}{8}$ more than the distance *G*, Fig. 3. Now if the lines shown in Fig. 3 were followed and the cam cut according to them, we would have rather sharp turns at three points in the groove, but this was helped by making the lines curved instead of straight from point to point, and was left to be done afterward on the former, which will be described further on. Fig. 4 shows the cam *a* fitted on an arbor *c*, but free to slide on same. The pulley *B* was fitted in the same manner also, but in addition had a key in it which fitted a keyway in *c*, so that, although *B* was free to slide back and forth on *c*, it was compelled to revolve with *c*. A small hole was drilled into the side of the cam blank *A*, Fig. 1, into which a pin was driven and allowed to project about $\frac{1}{8}$"; a notch was then filed in the hub of *B*, into which the pin fitted, thereby furnishing a means for driving *A* by *B*. The spring between the dog *D* and cam *a* being compressed, held *B* tightly against the guide *E*, which was bolted to the platen of the milling machine, the arbor *c* being carried on a pair of ordinary centers, one of which could be revolved by a crank in the ordinary way.

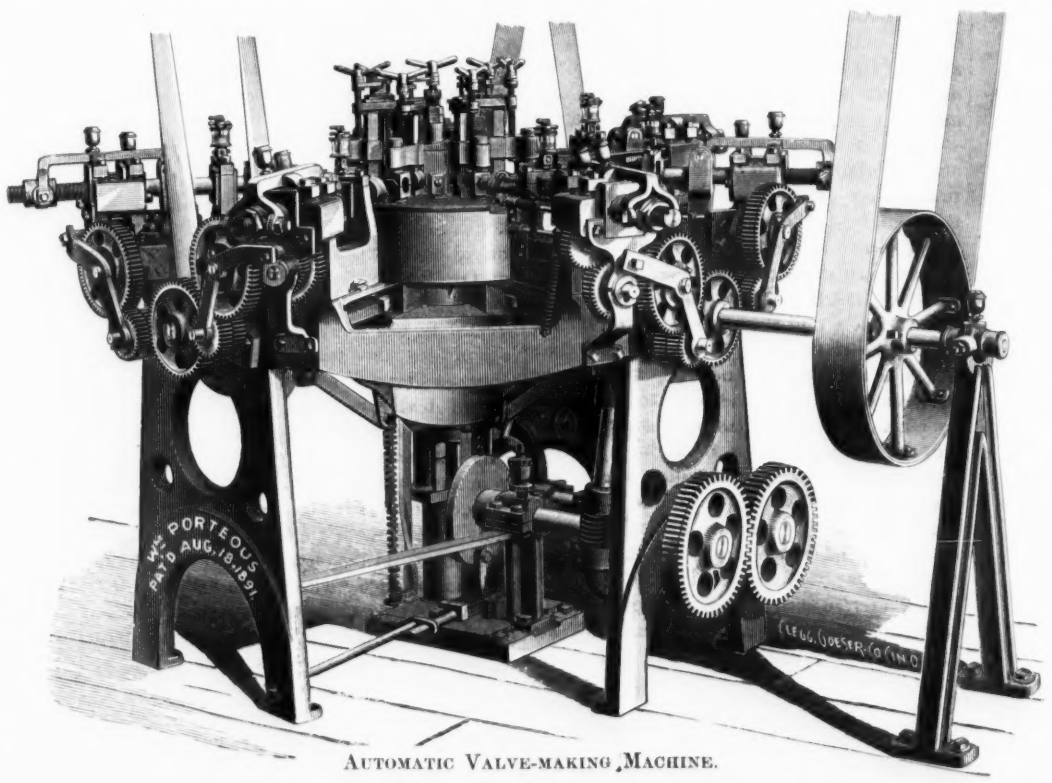
To more clearly explain the action of this device, let us suppose that the edge of the pulley *B* which runs against *E* was faced up perfectly true, the center of our end mill being on the same plane as the center of the arbor *c*, and we move the platen in until the mill begins to cut a little on the periphery of *A*; then by revolving all the parts on the centers would simply form a shallow groove in *A*, the same as would be done were *A* driven on a mandrel tight and the groove turned out on a lathe. If, however, a part of *B* is filed away, say $\frac{1}{8}$" deep from the edge which runs against *E*, we would find, when the depression reached the point *E*, that the spring acting against *a* and *B* would cause them to slide on the arbor $\frac{1}{8}$ of an inch in the direction of *E*, which, being stationary, will force the parts back to their normal position as they continue to revolve. From the foregoing it will be readily seen that, in order to produce the form or path of groove called for, all that is necessary is to form a part of the edge of *B* in the proportions given in Fig. 3. The circumference of the edge of *B* being greater than *A*, the irregularities which might exist from filing the curves on *B* will be reduced proportionately in the cam *A*. Two end mills were used, the finishing cut being about $\frac{1}{64}$". In conclusion, let me suggest to those who may never have thought of it, that a wide groove in a roller may in some cases be milled out to better advantage than it can be done in the lathe in the usual way.

Automatic Valve-making Machine.

The engraving herewith presented is of an automatic machine for finishing globe valves or other similar work usually finished in brass-working shops.

The central part of the machine consists of a revolving turret or turn-table, upon which there is mounted seven chucks for holding the work, these chucks being of such form that they readily hold any ordinary piece of work, and can be adapted for special work. As the turret with the chucks revolves it brings the work successively before the spindles which carry the tools, there being six of these spindles mounted in heads surrounding the turret. As the turret revolves the chucks revolve upon it at any desired points, so that different sides or surfaces of the work are presented to the action of the tools one after the other until all are finished.

Taking the case of a globe valve, for instance, requiring to be bored, faced and threaded at each end for the pipe, and the seat finished and threaded for the bonnet. A casting is put into one of the chucks by the operator, and at the end of its journey around the machine it is finished, being operated upon by one spindle after the other, and turned at the proper points to place it in the various positions necessary. When it has completed a revolution it is taken out and another casting put in its place, six valves being operated upon simultaneously after the first has completed its cycle. The spindles are fed forward automatically, and those for threading are automatically reversed at the proper points to run off the die or withdraw the tap. The speeds of the different spindles are independently variable, to accommodate them to the character of work being done. The adjusting is very simple, since the tools for a given job are made of the proper length, and it is only necessary to insert them in the spindles to a fixed stop. There are means for disconnecting any spindle for convenience in removing tools, or where any one or more spindles are not needed for the work being done.



AUTOMATIC VALVE-MAKING MACHINE.

The machine is adapted for making brass cocks, mountings for valves, such as bonnets, etc., gauge cocks, water gauges or any similar work, and can also be used where the work is of iron, but of similar character, requiring to be done in large quantities.

The machine is the invention of Mr. William Porteous, superintendent of the William Powell Brass Works, Cincinnati, O., where one of them is at work turning out $\frac{1}{2}$" to $\frac{1}{2}$" globe valve bodies at the rate of 2,500 per day, and sizes from $\frac{3}{4}$" to 1", at an average rate of 2,000 per day. Machines for doing larger work are being built.

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☞ Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.

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☞ We invite correspondence from practical machinists, engineers, inventors, draftsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.

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NEW YORK, DECEMBER 10, 1891.

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What the World Owes to Men.

Some quite remarkable things were said recently at two gatherings of widely different character, the one a meeting of the New York Chamber of Commerce, the other the Episcopal Congress in Washington.

At the former meeting, Bishop Potter, after referring to the propriety of providing for a rainy day, said: "We, in this land, have entered upon a race for wealth, to which, I think, the past furnishes no parallel. What is to be the end of it? It was an accepted fact that there could not be great wealth without great temptations to indolence, to vice, to social and political corruption." He thought that the science most needing study is that of redistribution, and in effect seemed to advance the idea that the problem would be solved when wealthy men were educated to spend their money in various public charitable or semi-charitable movements.

Chauncey M. Depew said, among other things: "We fear socialism and anarchy, but they don't grow from the harangues of agitators, the spouting of demagogues. They come from real conditions, and these [conditions] men of wealth must meet. The employer who teaches that he is a master of slaves is a teacher of socialism. Any rich man who uses his wealth unwisely is more powerful for anarchy than all the Mosts, and all the men hanged in Chicago." He thought that what was needed was education—that sort of education which would enable men to take "broad, liberal and catholic views of everything, and would enable them to see the truth, no matter how it may be incrusted, or how hard the hammer must hit that crust."

At the Washington meeting, a majority of the speakers seemed to favor some form of socialism, and, in fact, several of them openly avowed themselves as being what are known as "Christian Socialists."

We mention these things here because it seems to us that the circumstance is somewhat remarkable, as indicating the trend of thought in certain quarters; for it is to be noted that the propositions to have wealthy men spend their money for the general good is not very far removed from socialism, if indeed it is not socialism pure and simple, and we give it as our humble opinion that the world never can be reformed on any such lines. The accumulation of dangerously large fortunes will go on, in spite of all such preaching, so long as the facilities, and even the temptation for their accumulation, are furnished by social conditions, and such accumulations can only be arrested by removing some of the facilities at present afforded by law, to the end that men may be placed on a more equal footing—not with regard to their possessions or attainments, but with regard to their opportunities for performing the work to which they are best adapted, and getting returns proportioned to services rendered. So long as there are men able and willing to work, who have not the opportunity for doing so, we can know that there is something wrong with the social system; but that wrong does not lie in a mere difference of possessions as between individuals, and is not to be righted by requiring or persuading men to redistribute. Neither can it be righted by condemning men simply because they have acquired wealth, to which the laws of the land give them a clear title, and which they, therefore, believe they have a right to keep, or to dispose of as may seem best to them. If our system favors the accumulation of fortunes too large to be consistent with the highest public good, as many believe it does, or if it enables men to get wealth for which they give no adequate return, as it undoubtedly does, then the system should be changed to give all an equal opportunity, after which no individual, it seems to us, will have just cause to complain of society; for it will be understood then that "the world owes a living" to him who goes to work and earns it, and that the debt will infallibly be paid. The world owes no one a living, but it does owe every one an opportunity for earning a good living, and when this obligation is discharged no individual can complain of society, or claim charitable assistance as a right.

Naval circles have evidently been somewhat startled by the publication in the New York *Times* of articles which seem to establish the fact that a serious mistake has been made in the construction of the cruiser "Philadelphia," which, by changes in the original designs, purchased by the Government from Sir William Armstrong & Sons, shipbuilders on the Tyne, England, has been given so low a metacentric height as to make it more than probable that she would roll dangerously in a rough sea, if indeed she did not turn bottom upward. This is thought to be due mainly to the fact that considerably lighter machinery was put into the vessel than the original designs called for, thus reducing the weight below the water line, while a protective deck, heavier than that contemplated by the original designs, increased the weight above the water line, the result being that the vessel is dangerously top-heavy. It is estimated by Naval Constructor Mintonye that two hundred and seventy-five thousand dollars should be spent in alterations upon the vessel, which, if it turns out to be necessary, will prove quite an expensive lesson as to the risk assumed in materially altering a design for a structure of any kind without going over the whole work in the most thorough manner.

It ought to be a well-understood fact that, when alterations of any moment are to be made in the designs of an important structure, there is usually no safe plan except to go through every step in the designing of the complete structure as amended.

Brooklyn, N. Y., has recently experienced something likely to set the citizens thinking of the blessings of water. By the breaking down of the main conduit the city was left almost literally without this necessary fluid for some time, the result being that the elevated roads were in part obliged to discontinue operations, and manufacturing establishments were forced to shut down. A large fire would doubtless have proved very damaging, from lack of water with which to fight it. All this, naturally enough, leads up to the question of whether it is wise for a great city to depend upon one means of getting water to its inhabitants. The failure of this means, which is always liable to occur, may not only mean serious inconvenience, as in the instance of Brooklyn, but it may mean pestilence, and an enormous loss of property. The water question—the question of supplying a great city with water—seems to take on new aspects every year, and will bear a good deal of careful study.

The difficulty in introducing any new device in railroading is seen in the instance of the car coupler. The coupler recommended by the Master Car Builders is, it appears, opposed by some labor organizations, not because its use would not result in the saving of life, but because it throws skilled labor out of employment, it being held that the old device required skill on the part of the operator, while the new one is practically automatic in its operation. But, aside from any objection on the part of workmen, the introduction of an automatic car coupler presents a serious problem to the railroad companies. If the change could be made on all roads at once, there would be little difficulty in the matter. But as this cannot be, there is the difficulty of coupling cars with all sorts and descriptions of coupling devices, so the whole matter must rest.

The absurdity of most of the newspaper items relating to mechanical and electrical matters is well illustrated by the following burlesque of them by Williston Fish, in *Puck*. It is ridiculous, but scarcely more so than many which are published in all seriousness as important matters:

The latest electrical device is a machine with four horizontal swinging arms revolving in a vertical plane. The driving shaft, a special feature, is keyed firmly to a diagonal slot, gearing into four six-sided pulleys. On the rack of the shaft is drilled a countersunk lag-screw, and all rivet and bolt holes are upset and turned to scale. The armatures, mounted on water-borne journals at either end, revolve independently, and motion is communicated to the machine by means of a crank turned by an Irishman.

James Dredge, one of the British commissioners who recently visited Chicago, it is reported, has been invited, and has consented, to lecture before associations of manufacturers and art societies throughout England upon the Exposition, and the arrangements that have been made for foreign exhibitors. By means of a stereopticon he will illustrate his lectures with views of the Exposition grounds and buildings.

It is reported that the Colts Armory, which was some time ago equipped with a plant for the manufacture of the Driggs-Schroeder rapid-fire gun from the shops of the Pratt & Whitney Company, has found itself unable to keep up with the demand for the gun, and the Driggs-Schroeder people have entered into a contract with Cramp & Sons, of Philadelphia, for building a lot in addition to those made at Colts.

Railroad trains are frequently, in this country, blockaded by snow and ice, and occasionally by grasshoppers. But it appears to be new that the fall of leaves on the track is playing an important part in the delay of trains. Some Connecticut roads have had quite a serious experience in this direction, the leaves providing all that is necessary for making a slippery track.

Right along, and in various parts of the country, the "Endowment Associations," that promise to pay something for nothing, are being shut out of business by the courts, which is very satisfactory, particularly as the money they handle comes mainly from hard-working people.

Now the scientists tell us that the earth's axis is unstable, and that scientific calculations based upon the assumption that the axis is permanent are misleading. This, it is claimed, accounts for the miscalculations of astronomers during the past two hundred years.

There is only one trouble about the use of the electric light for illuminating purposes; that is, the cost. When the cost can be reduced, nothing can stand in the way of electricity.

Aliens, it is said, own twice as much land in this country as they do in Ireland.

QUESTIONS AND ANSWERS.

Questions of general interest relating to subjects discussed in our columns will receive attention in this department. The writer's name and address should always accompany the question. Neither correct initials nor location will be published when there is a request to that effect. If questions are enclosed with a business communication, they should be written on a separate sheet.

(528) A., Fort Wayne, Ind., writes: Kindly inform me through your columns what will be the least width of a good double leather belt running over a 55-inch turned iron pulley, speed of belt 3,500 feet per minute; it is to transmit 300 horse-power. *A.*—We should use a belt 43 inches wide.

(529) I. H. B., Chicago, Ill., wishes us to settle a dispute between A. and B. relating to the expansion of steam. The questions are of such an elementary character that they need not be repeated here. A. is correct, and before B. enters again into a dispute of this kind he should read some elementary works treating on this subject.

(530) J. D. R., Toledo, Ohio, writes: I think that I read something in your paper not long since, describing how blue print paper could be made more sensitive by adding an acid to the solution. That is, it could be made to print quicker. I have

searched all the papers published during the last three months and fail to find it. Will you kindly inform me where to look for it? *A.*—August 13, page 7, current volume.

(531) G. W. C., Providence, R. I., writes: I would like to know what size of marine boiler should be used, and the probable cost of the same, for a launch 18 feet long and 5 feet beam. I would like to get the lowest figures, and the name of a desirable party to confer with in regard to the boiler. *A.*—We should use a vertical boiler, 22 inches outside diameter. Furnace, 16 inches diameter and 20 inches high. Eighteen tubes, 2 inches diameter and 20 inches long. For the price of the boiler write to any reliable boiler maker.

(532) H. D. H., Brooklyn, N. Y., writes: Kindly inform me if the Washington Navy Yard has a technical school for apprentices, and if so, what are the studies, and will a graduate from that school be a consulting engineer? *A.*—There is no technical school in the Washington Navy Yard. Instructions are given in marine engineering in the United States Naval Academy at Annapolis. The studies embrace all subjects relating to designing and running marine engines. A graduate from this Academy, with some years of experience after completing his studies, may become a consulting engineer in that particular branch.

(533) W. R., ——, asks: What decimal do you multiply the diameter of a threaded bolt by to ascertain the diameter at the bottom of the thread? *A.*—The finding of the diameter at bottom of thread, though a very simple matter, is not quite so simple as you seem to think it. If the thread is U. S. standard, divide 1.3 by the number of threads per inch, and subtract this quotient from the ontside diameter. The formula for this is

$$d = D - \frac{1.3}{n}.$$

If the thread is sharp V (which it ought not to be) divide 1.733 by the number of threads per inch and subtract the quotient from the outside diameter, the formula for this being

$$d = D - \frac{1.733}{n}$$

(534) J. T., Göteborg, Sweden, writes: I have read in your issue of November 5, current volume, an article relating to "A Wonderful Mineral Substance," taken from the *Boston Transcript*. I wish to enter into correspondence with the party who has the control of this substance. Kindly give me full address and particulars. *A.*—We referred this matter to the Western Electric Company, of New York, who reply as follows: "We believe the name of the party referred to in the clipping from the *Boston Transcript* is D. N. Hurlburt, 45 Broadway, N. Y. City. Mr. Hamilton has no recollection of making a statement to the effect that the substance on the wire sent him for test offered sevenfold the insulation resistance offered by other insulating materials, as stated in the clipping."

(535) R. D., Habana, writes: I have been preparing some heliographic paper, but fail to get the right tint, as also of making a good print. The mixture turns blue instead of yellow, as I have seen it in the case of mixtures made by parties in New York. I have seen paper prepared which had a clean lemon-yellow color. I made my preparing in a very dark room Please give me, as soon as possible, a good formula for preparing paper; and also give me a reason for my failure. *A.*—We cannot give a reason for your failure; there has evidently been a mistake somewhere. You will have no failure by using the following formula: Dissolve 2 ounces of citrate of iron and ammonia in 8½ ounces of water; also dissolve 1½ ounces of red prussiate of potash in 8½ ounces of water; when the two are dissolved mix them in a dark bottle and keep it in a dark place for future use, and follow the directions given in answer to Question 117, in our issue of March 5th, current volume.

(536) J. F. F., St. Louis, Mo., writes: Kindly give me the proper size of a fly wheel for an 8x12 inch engine, running at a speed of 100 revolutions per minute. *A.*—If space will permit we should make the wheel 5 feet in diameter; and if very steady running is required we should find the weight of the fly wheel by the formula used by the Buckeye Engine Co, which is as follows:

$$785{,}400\,\frac{d^2 \times s}{D^2 \times R^2} = W,$$

in which d denotes the diameter of the cylinder in inches; s the stroke in inches; D the diameter of the wheel in feet; and R the number of revolutions per minute. Substituting for the symbols their values we have $785{,}400\,\frac{8^2 \times 12}{5^2 \times 100^2} = 2{,}413$ pounds for the weight of the fly wheel. If very steady running is not required, the weight of the wheel may be less than found above.

(537) A. W. C., Chicago, Ill., writes: Kindly inform me, if possible, where I can obtain the complete working drawings for a small (say 4"x6") horizontal steam engine. Has the AMERICAN MACHINIST ever published the same, or do you know of any book that contains them? To what firms would you recommend me to apply? *A.*—Write to Geo. W. Melville, Engineer-in-Chief U. S. Navy, for the Annual Reports of the Chief of the Bureau of Steam Engineer. These reports abound with good drawings of all kinds of engines, including both single and multiple cylinder types. If you state in your letter that these reports are to be used in a manual training school, they will undoubtedly be sent to you. Even if these reports do not contain the drawings of the exact type of engine you are seeking, they contain enough matter to enable the teacher to design and sketch one, so that the scholars can make the working drawings, which will be excellent practice. The bureau frequently furnishes plans and specifications of engines of the bureau's design to educational institutions which give instructions in marine engineering.

(538) J. A. S., Janesville, Wis., writes: I am desirous of attending a mechanical school, but I do not know where to find one; perhaps you can give me the names of a few good ones. I am 24 years of age, and have worked at the painters' trade three years, molding five years, and I have been at work for the last few years in a machine shop, and have obtained as good an idea of general machine shop practice as is possible to get in that length of time. I have studied mechanical drawing in the evenings at home, so I have a little start. I want to go to the top. Is there any school where I can work a little so as to help pay the expenses; and can you give me some advice as to the course I should pursue? *A.*—There is at Madison, in your State, the University of Wisconsin, in which mechanical engineering is taught. Write to the President of the University and state your case; he will undoubtedly take pleasure in giving you all the information you desire. If you find that you can not pass the examination for admission, take private lessons relating to subjects in which you are deficient. If circumstances will not permit you to do so, then follow the course indicated in our issue of February 19th, current volume.

(539) S. B. R., Watsonville, Cal., writes: Please give formula for computing the size of steam and exhaust pipes. *A.*—These sizes can be readily computed with the aid of the following table:

Piston speed, feet per minute.	Diameter of steam pipe (diameter of piston = 1).	Diameter of exhaust pipe (diameter of piston = 1).
200	.158	.223
250	.176	.248
300	.194	.272
350	.209	.294
400	.224	.314
450	.237	.333
500	.250	.353
550	.260	.368
600	.274	.385

The above table has been taken from "Slide Valve Gears," by F. A. Halsey. To show the application, let it be required to find the diameter of the steam and exhaust pipe for a cylinder 18 inches diameter, the piston speed being 550 feet per minute. In the table it will be seen that for the given piston speed the diameter should be equal to .260th part of the piston diameter, hence $18 \times .260 = 4.68$, say 4⅝ inches for the diameter of the steam pipe. The diameter of the exhaust pipe should be $18 \times .368 = 6.62$, say 6⅝ inches.

(540) S. R., San Francisco, Cal, writes: Kindly answer through your columns in regard to the following: I am desirous of becoming a locomotive engineer. I thought of trying to get a position in some railroad shop, or take a job as fireman. What plan would you advise me to follow? I am 18 years of age, and have worked in a sewing machine repair shop. Are there any books published which will enable me to become a locomotive engineer? Am I old enough? What is the average pay of locomotive engineers? And how long will I have to work as a fireman? *A.*—You are old enough. Try to obtain a position as fireman, and devote your leisure hours to study. In regard to books, Locomotive Engine Running and Management, by Angus Sinclair; Progressive Examinations of Locomotive Engineers and Firemen, by John A. Hill; Catechism of the Locomotive, by M. N. Forney, are good books; and should you wish to become familiar with the construction of the locomotive, Modern Locomotive Construction, by J. G. A. Meyer, now in press, will aid you. If you cannot obtain a position as fireman, try to get work in a railroad shop, so as to become familiar with the different parts of a locomotive. The average pay of locomotive engineers is from $100 to $125 per month. The length of time that you will have to work as fireman will depend on your own exertion, and the time at which a vacancy occurs.

(541) H. F., Brooklyn, N. Y., writes: Please explain what is understood by the pitch of a propeller. *A.*—It is the distance which any point in a blade, describing a helix, will travel in the direction of the axis during one revolution, the point being assumed to move around the axis. From this definition, the pitch of a propeller with a uniform pitch is equal to the distance a propeller will advance during one revolution, provided there is no slip. In a case of this kind, the term "pitch of the propeller" is analogous to the term "pitch of the thread" of an ordinary single-threaded screw. In the latter the pitch is the distance, measured in the line parallel to the axis, between two adjacent central points of the thread; and it is equal to the distance that the screw will advance during one revolution. The pitch of a propeller having a uniform pitch may be defined in a similar way. Assume that one blade extends clear around the axis, so as to form one continuous thread all around the shaft, then the pitch is the distance between any two adjacent points in the surface of action, lying in a line parallel to the axis Sometimes propellers have a varying pitch; in such cases the point in the blade at which the pitch is to be measured, must be given. In such a case, the pitch is equal, according to the first definition, to the distance the given point will travel in the direction of the axis during one revolution of the propeller, provided there is no slip at that point.

(542) C. A. B., La Crosse, Kan., writes: Kindly give me your opinion relating to the following; I have an upright 10 horse-power traction engine with reversing links. When the valve is set properly for both the forward and backward motion with $\frac{1}{16}$-inch lead in full gear, then when the link is hooked up to midgear the valve will not keep the ports covered. By uncoupling the eccentric rods and coupling them in the reverse order to the link, then the valve will keep the ports covered when the link is hooked up to midgear. But this change throws the reversing lever in backward position when the engine is going ahead. The eccentrics are keyed to the shaft and are all right just as they came from the factory. The valve has ½-inch lap, length of valve, 4⅜ inches. Now, what I would like to know is where the trouble is, that I cannot get the valve to cover the ports when the link is hooked up to midgear with the reverse lever in forward position when the engine is going ahead. *A.*—We do not see anything that should trouble you. The eccentric rods were correctly coupled to the links in the factory. By connecting the eccentric rods to the link as you have done there will be no lead; in fact, you will have negative lead when the link is hooked up, and therefore the engine will not be as powerful with the link partly hooked up, and with early cut-offs it may not be able to do the work for which it was designed If you insist on making the change, then the manner of suspending the link will also have to be changed, so as to bring the reverse lever in the forward position when the engine is going ahead. Whether this change can be conveniently made will depend on the design of engine, of which you have said nothing.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

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Link-Belting and Sprocket Wheels.

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Our Automatic Gear Cutting Machine will increase production 50% The Superior Mach. Wks., Clev'd, O.

$13 00 I Dea L. Drawing Stands. The original. Send for postal. W. S. Rogers, Troy, N. Y.

S. A. Smith, 23 South Canal Street, Chicago, Ill., agent for Holbrook's Raw Hide Blanks for Gears.

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Save small iron from foundry refuse. It pays. Use the Woodruff Pat. Separating Machine, Audubon Machine Works, New Haven, Conn.

"Roper's Hand-books for Eng'rs and Firemen." Descriptive Catalogue mailed free to any address. Edw. Meeks, Pub, 1012 Walnut St., Phila., Pa.

Thos. Pray, Jr., 193 *Times* Build'g, N. Y., attends to calls for Indicating and Testing Steam Plants, Water-works, Locomotives & S. S.'s. Write or call.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocum & Son's Shafting Works, Drinker St., Philadelphia, Pa.

S. W. Card & Co., Mansfield, Mass., make everything in the line of Taps and Dies. S. A. Smith, 23 S. Canal St., Chicago, Western Agent.

For best Return Steam Traps, Pressure Regulators, Positive-Acting Pump Govs., Back-Pressure Valves, T. Kieley, 11 W. 13th St., N.Y. Send for des'n.

For the Latest Improved Diamond Prospecting Drill, address the M. C. Bullock Mfg. Co, 138 Jackson St., Chicago, Ill.

Milliken & D'Amour, No. 151 Cedar Street, New York City designers and builders of labor-saving and automatic machinery and tools to order.

For Sale—28"x12' and 32"x16' engine lathes; new, with compound rest and power cross-feed. W. P Davis, Rochester, N. Y.

N. Y. City Bolt & Nut Co., Limited, 33 and 35 Desbrosses St., N. Y. City, manufacturers of Machine Bolts of every description. Write for estimates.

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Complete treatise on Screws and Screw-making, with clear and concise explanation of the methods; 95 illustrations. Price, $1.25 postpaid. E. & F. N. Spon, 12 Cortlandt Street, New York.

"Hawkins' Maxims and Instructions for the Boiler-room." 10 Parts, 25 cents each. Catalogue free. Theo. Audel & Co., Pubs., 91 Liberty St., N. Y.

De Lamater Screw Propeller Wheel, made only by The Samuel L. Moore & Sons Co., Elizabethport, N. J., who have purchased from C. H. De Lamater & Co., New York, all their patterns, books of record, gauges, etc. Location and equipment well adapted for Heavy Steamship Repairs.

Brown & Sharpe Mfg. Co., Providence, R. I., announce that the prices of their Swivel Vises for use on milling and planing machines have been reduced. Price of the No. 2 vise is $24.00; price of the No. 3 vise is $30 00. Former prices, $31.00 and $38 00.

Club Rates.—If no one is getting up a club for the AMERICAN MACHINIST in your town or establishment, send for Circular of New Club Rates, and try it yourself. Address AMERICAN MACHINIST, 96 Fulton St., New York.

"Binders" for the AMERICAN MACHINIST. Two styles—the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers with full page opening flat. Either will hold the entire 52 issues of any volume. American Machinist Publishing Co, 96 Fulton St., New York.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator and making all required calculations from the diagram, also the principles of economy in operating steam engines and current practice in testing engines and boilers. Price, $2 postpaid. Published by John Wiley & Sons, 53 East Tenth Street, New York.

MANUFACTURES

A $400,000 cotton-mill is to be built at Riverside, Ala

It is stated that Jones & Laughlin will erect a steel-mill, at Pittsburgh, Pa.

The Pittsburgh (Pa.) Locomotive Works will build a large machine shop.

The Louisville & Nashville Railroad Company will erect repair shops at Montgomery, Ala.

An electric light plant will be erected at Hopkinsville, Ky. The mayor can give information.

It is stated that negotiations are pending for the removal of a nail factory to Newport News, Va.

The Keystone Bridge Company, of Pittsburgh, Pa., is rebuilding part of its erecting department.

A foundry and machine shop will be established at Ivanhoe, Va., by J. H. Gills, formerly of Raleigh, N. C.

The Germania Electric Company, of Boston, is to start a large manufacturing plant at Marlboro, Mass.

A 250x75-foot, two-story addition is to be built to the plant of the Beiden Machine Company, at New Haven, Conn.

A cotton-mill will probably be established at Howardsville, Va., by the Virginia Steel, Iron and Slate Company.

New machinery is to be added that will double the capacity of the Tuscaloosa Rope and Yarn Mill, Tuscaloosa, Ala.

The Pulaski Electric Company, capital, $25,000, has been organized at Pulaski, Va. J. R Miller can give information.

The total length of the Bucyrus Steam Shovel Company's plant at South Milwaukee, Wis, will be 900 feet, with a tower.

The Houston & Texas Central Railway Company (office, Houston,) is reported as to erect repair shops at Austin, Texas.

The Baker Iron Company, of Jasper, Tenn., will purchase a full outfit of machinery for the manufacture of bar-iron and steel.

The Jas. Jones Manufacturing Company, of Belleville, Ill., have increased the capacity of their works by adding an addition.

The Porter Machine Company, of Newark, N. J., is erecting an addition to its works 103x65 feet in size, and three stories in height.

It is stated that the Pembroke iron plant at Washington, Maine, is to be converted into a manufactory of electric cars and motors.

A passenger car shop, 138x238 feet in size, is to be built by the Pennsylvania road at Renovo, Pa. Ground has been broken for the structure.

The White Sewing Machine Company, of Cleveland, O., will erect a factory 82x200 feet, three stories, built of brick. The cost will be about $17,000.

Robert and Joe Wood have purchased the interest of D. C. Morris in the electric light plant at Morristown, Tenn., and the system will probably be improved.

The P. B. Hand Manufacturing Company, of Handsboro, will, it is stated, erect in Long Beach, Miss., a factory for the manufacture of patented iron articles.

The Litchfield Car Company, of Litchfield, Ill., has within the past month taken orders for 1,500 box and coal cars. The company will add new machinery to its plant.

An Edison incandescent electric light and power plant may be erected in Baltimore, Md., as efforts are now being made to organize a $1,000,000 stock company for that purpose.

The citizens of Gonzales, Texas, are actively engaged in securing means for the erection of an oil-mill and a cotton gin. At a recent meeting 202 shares of stock were taken.

A. G. Thurston Sons, of Fall River, Mass., have made considerable additions to their machine shop by adding a new plant for the manufacture of plate rolls and general mill machines.

The Houghton Machine Manufacturing Company, capital, $500,000, has been incorporated at Harper's Ferry, W. Va., by J. Q. A. Houghton and others, to make a patented buttonhole machine.

Plans have been prepared for a blacksmith shop and boiler works for Edw. Kendall & Sons, Cambridgeport, Mass., to be 60x282 feet in size, one story, built of brick, and to cost $12,000.

The City Foundry and Machine Works have just started at Massillon, Ohio. The company makes castings of all kinds, and does a general machine shop business, giving special attention to repairs

The framework of the Harney Peak Tin mill, at Hill City, S. D., is finished. The first of December will see the building inclosed. The plant is expected to be ready for operation early next spring

The Pennsylvania Lubricating Company has been formed at Joliet, Ill., for the manufacture of lubricators. The capital stock is $25,000. Grant McCargo, Wm. Gardner, and F. C. Caldwell are the incorporators.

The Robinson-Rea Company, of Pittsburgh, Pa., has been awarded the mill contracts by the American Tin-plate Company, of Elwood, Indiana. It is stated that the new plant will employ about 1,000 men.

John J. Hill, W. H. M. Hill and D. H. Curtis, of Chicago, have incorporated the Hill Double Lock Safety Switch Company, with capital stock of $25,000. The company will manufacture railway switches.

Walter Hanson, Luke Strider and Frank Aldrich have incorporated the Hanson Battery Light and Power Company at Washington, D. C., to produce and furnish electricity for light and power. The capital stock is $1,500,000.

Chandler & Taylor Co., Indianapolis, Ind., issue a catalogue, "Series B," in which are illustrated and described types of engines and boilers built at the works. The illustrations are very complete, going quite extensively into details.

The Nowlin Safety Switch and Signal Company, of Chicago, has been incorporated, with capital stock of $500,000, for the manufacture of railroad appliances. The incorporators are C. E. Nowlin, Charles Kirchner and W. G. Barnet.

George Finfrock, J. J. Alspeter and George Veesenmeyer, of Chicago, have incorporated the Finfrock & Veesenmeyer Patent Journal Oiler Company, with capital stock of $1,000,000. The company proposes to manufacture a patent journal oiler.

A complete outfit of new machinery will be put in the large flouring-mill plant of the City Mills Company, at Knoxville, Tenn., and the capacity doubled. The machinery will be purchased at a cost of about $25,000. J. Allen Smith is president of the company.

It is reported that the Chickamauga Foundry and Machine Company has purchased, and will operate with doubled capacity, the Tennessee Iron Fencing Company's plant; also remove to Chattanooga, Tenn., and operate the hay press factory of J. M. Sanders & Co. at Dalton, Ga.

James Fox, J. E. Febrey, Chas. S. Young and Geo. F. Chapman, of Elizabeth, N. J., have incorporated the Railroad Automatic Torpedo Machine Company of that city, with capital stock of $25,000. The company will manufacture and sell torpedo machines and other railway appliances.

Recently Ball Brothers tin stamp works, at Muncie, Ind., were destroyed by fire. Work has begun on the rebuilding of the plant, which will be pushed as rapidly as possible. The building will be fireproof, made of brick and iron with cement floors. It will be 500 feet long, 70 feet wide, and two stories high.

The Covington & Cincinnati Rapid Transit Bridge Company has been formed at Cincinnati. The company intends to construct a bridge over Ohio River between Cincinnati and Covington, Ky. The incorporators are Geo. Bullock, Stephen R. Burton, Chas. B. Simrall, R. W. Nelson and D. P. Eells.

The Jos. Dixon Crucible Co., Jersey City, N. J., send us a fine assortment of their graphite pencils—something more than a baker's dozen of different colors and grades of hardness—arranged in what serves as a case. Schoolgirls and boys will be considerably more than pleased with such a packet, and older people will not object.

The Boston Steam Gauge Company has been organized in Portland, Me. The officers are: President, Charles A. Wentworth, Hyde Park, Mass.; treasurer, Henry L. Willard, Hyde Park. Directors: Walter L. Whitney, Millbury, Mass.; Henry L. Willard, Murdock McNeil, Boston; Charles A. Wentworth; capital stock, $100,000.

The smelting company whose plant is located at Omaha, Neb., will make an addition thereto for reducing copper ore, and it is expected to turn out five tons of copper per day. A building about 150x80 feet will be erected for this purpose, fifty men will be employed, and $75,000 worth of machinery put in the building. A great deal of the machinery is already on hand.

It is reported that the Webster, Camp & Lane Machine Company, of Akron, will locate at Kent, Ohio. The matter has gone so far that the dimensions of buildings have been decided upon. The buildings are to be of brick, and they, with the grounds, are to cost $75,000. They are to be erected by the town, under the supervision of an architect to be selected by the company. The main structure is to be 300x100 feet, two stories high. The foundry is to be 250x75 feet, with an "L" 100x75 feet. The building for storage purposes will be 250x75 feet. There will also be numerous other buildings of smaller dimensions. The company binds itself to employ at the start 300 men, and expects, just as soon as more machinery can be put in position, to have 500 men at work.

Discussion of Topical Questions at the New York Meeting of the Mechanical Engineers.

Last week, for lack of space, we were obliged to omit the discussion of Topical Question Number 104 which was:

"HAVE YOU HAD ANY EXPERIENCE WITH SYSTEMS FOR THE PURIFICATION OF BAD FEED WATER BEFORE IT GOES INTO THE STEAM BOILER, EITHER BY PRECIPITATION OR OTHERWISE?"

Mr. Kent: I was hoping that the gentleman who suggested this topic would be here to bring out the points he desired. He said, "Bad feed water." Now that word can be considered widely or otherwise. The question is, what degree of badness he would like to consider, and also, as I should judge, what to add to the water he has, in view of the chemical and vegetable matter in the feed water. But I would like to ask if any gentleman here has had much experience in the matter of cleansing feed water from grease and oil. With the surface-condensing system this is an evil we have to contend with, and sometimes is a very serious matter; and I would like to give a little experience that I had. In these higher pressures and temperatures we find that, of course, as we all know, there is a different chemical action on the lubricants as used in engine cylinder. For instance, it is a very easy matter to filter feed water when we have low steam pressure, but it is a difficult matter with higher pressures, and in these modern days the higher pressures are the rule. Let me instance a case in point. A certain stationary Corliss engine, 140 boiler pressure, was in use, and they had trouble from the beginning with the boilers, the tubes leaking—a very serious matter. We discovered that the parties in fitting up the engine had not provided a copper box for the feed water; there was not enough filtering material on the chambers in the box—at least it was so supposed—and a large filter was substituted, but it had very little beneficial result. The feed water as it came from the air-pump seemed to be a perfect emulsion of water and grease—that is, milky water; and, no matter how long it stood, it would still remain so, very little grease rising on the surface, but still remaining in this cloudy condition; and, although an improved filter was afterward put in, it seemed to benefit it very little, and it was a serious matter as to what they should do until they had tried a filter designed with the chemical arrangement of coagulation; and then they were able to clear the water perfectly, so that it was as clear as spring water, and the trouble ceased with the boiler.

Mr. Ashworth: This question of bad water, or water impregnated with very injurious properties for the generation of steam, has been a perplexing question in our section of the country, and in the tributaries of the Mississippi. We have for a long time recognized this simple fact, that the proper rule is to catch the impurities before they enter the boiler; and it can only be done by heating it up to the temperature that is kept in the steam boiler. On the Monongahela and Allegheny we have that trouble to a great degree, and to the people in the eastern section of our country, and in the northwest, it becomes a matter of surprise that we have a condition almost lapsing into a primitive barbarism as regards our steam boilers. I have no doubt that many excellent boilers, well adapted to perform their functions in every other respect, have been entirely ignored and condemned through a lack of facility for meeting this important requirement. Some time ago this matter was presented before me, and after a thorough review we introduced a system of purifiers, which were of the cylindrical form, having a series of shelves, and a thorough circulation is conducted through these. I think it is known as the Hoppes system, and while it is still a brief period since the introduction of the system, it has up to the present time worked with admirable effect, and is thoroughly satisfactory. I have witnessed the operation of this apparatus where artesian wells were driven in the city, where the boilers were taken out and every plan was introduced that it was claimed would obviate this difficulty without the outside influence of purifiers. In the period of eight days a formation would be on these shelves amounting to 2½ and 3 inches in thickness, and it was impossible to carry on their business successfully in the starch works without the application of this purifying system.

A member: I would like to ask Mr. Ashworth if he is familiar with the exact character of the impurities of the water in that section. Has any investigation been made to learn what these impurities are, whether chemical or vegetable?

Mr. Ashworth: They are a combination; we have a mixture of all these various impurities.

Another member: I would like to ask Mr. Ashworth a question. He said there is no way of removing the impurities except to be brought to the temperature of that carried in the boilers. Would that be necessary? or have any experiments been made to prove that the water had to be brought to a temperature or a pressure equal to that carried by the boilers?

Mr. Ashworth: It is absolutely necessary to bring it up to the temperature of the boiler.

A member: In other words, the purifier should be under the same pressure as the generator.

Mr. Ashworth: Yes, sir.

Mr. Kent: There was a system introduced some years ago by Mr. Blessing, of Albany, of taking the water out of the boiler and pumping it in again—removing the water, and removing the impurities, and pumping it back in again. In regard to another point made by Mr. Wheeler, the emulsion of the oil in water, I would suggest it might be well to use the Swedish system of extracting cream from milk, that is, the centrifugal force.

A member: I would like to ask the gentleman if there is anything else used in the feed water.

Mr. Ashworth: Nothing whatever; only a pure circulation.

Another member: We are troubled a great deal with the Croton water system. We tried a system in which we took a cylinder of thirty inches in diameter and twelve feet high and placed it so that from the bottom of it the water would run from natural gravitation into the boiler. We carried about eighty pounds pressure. We filled this cylinder. At the top of this cylinder we had a sprinkling arrangement with holes in it, and we filled this boiler pretty well up with coke, and connected the steam part as well as the water part of the boilers, so that we had a full pressure in this apparatus, and probably at least eight feet of it was the water. We ran it that way, fetching the water into the top there and letting the water sprinkle through the coke and steam space into our boiler, and there wasn't a particle of difference in the quantity of lime we got out of the boiler, which gave us the trouble in our boilers. Of course there is not a great quantity of lime in the Croton water, but we got a pailful a week in our tubular boilers, and we had to abandon it as absolutely worthless. After using it several months we could find no trace of the lime on the coke, or anywhere except in the boiler.

Mr. Odell mentioned some cases in Syracuse in which apparatus had been put in, in which the feed water was subjected to steam pressure about 20 pounds higher than that of the boiler. The plan had been entirely successful.

Mr. Falkenau: I had a little experience in connection with the boilers in the Edison station in Philadelphia, which caused a little trouble last year; and in that case they employed several different filters unsuccessfully, and finally put in some of these Hoppes filters spoken of, and they did not prove successful, and they finally used cups in their wells. The cups are put into the well, and they use an injection of caustic soda into the well every day, and that seems to answer the purpose.

Mr. Hoppes: The reason the purifier had not worked in this case was because it had never been connected up and used, their use requiring some alteration in the building, which they were not yet ready to make. I don't like to blow my own horn, but the gentleman made a statement that I think is incorrect in regard to the principle of our purifiers. They state it as a matter of precipitation. I would say, while our purifier is based on the plan of precipitation, it is not based entirely on that plan. Other purifiers that have been in use depend on the plan of precipitation or filtration. Some of the arrangements used in the boilers, called "skimmers," depend on skimming the top of the water to remove the impurities which float on the water, generally the carbonate of magnesia. Our pans are made in this form (indicating on blackboard). We have six pans in the purifier. The ends of the pans are higher than the sides. The water flows evenly on the under side of the pans in a thin film, and the impurities are caught on the under side of the pans. In this matter we have brought into practice an entirely new principle; it is not precipitation, and not filtration. We use no filter. We have formations showing as high as three inches, which form on the edge of the pans. It forms thickest on the edge of the pans and runs into a thinner formation at the center. The second pan has a less formation than the first, and the last pan will show perhaps a sixty-fourth or a thirty-second of an inch of the formation on the under side of the pan. Now the various waters that have different chemicals in them have different scales. The water that is the worst to handle forms a soft formation on the under side of the pan; it is composed of sulphates. I can tell very closely what the chemical analysis of a water is without making an analysis. The carbonates form a harder scale; and we like to handle waters that have carbonates best, because there is the least irregularity in the action of the purifier, and with water composed of sulphates the deposit is liable to wash off, it forms so soft a formation on the pan. On the second pan you will find the sulphates and carbonates mixed, and sometimes a very hard white scale will form on the lower pan, showing a silicate of lime and sulphate of lime combined together. The formations of the Beaver Fall plant spoken of I never saw, but I understood from one of my men that it also showed a good deal of vegetable matter. We understand when we see that also in water, besides the solid and the silicious there was a great deal of vegetable matter in it.

Launch of the U. S. Cruiser New York.

The cruiser New York, designated in the Department at Washington as armored cruiser No. 2, was successfully launched on the 2d inst. from the yards of Wm. Cramp & Sons, at Philadelphia. This cruiser is the most formidable war vessel yet built for the new navy. Her length on the water line is 380 feet 6½ inches; breadth of beam, 64 feet; mean draught, 23 feet 3½ inches; displacement, 8,150 tons; maximum speed, 20 knots; sustained sea speed, 18½ knots; complement (officers and men), 475; coal endurance (total capacity), 13,000 miles. There will be four separate engines of the vertical, inverted, direct-acting, triple-expansion type, arranged in four water-tight compartments. Each engine is expected to develop 4,500 indicated horse-power. High-pressure cylinders, 32 inches in diameter; intermediate, 46 inches; and low-pressure cylinders, 70 inches in diameter; all having a stroke of 42 inches. This vessel is to have an entire outfit of Blake pumps, including the special independent air-pumps for the main engines, and the hydraulic pressure pumping engines which will work the guns and turrets under a water pressure of from 600 to 1,200 pounds per square inch. The auxiliary condensers, which are to be mounted on the combined air and circulating pumps—Wheeler's improved system—will be furnished by the Wheeler Condenser and Engineering Company.

Steam will be furnished by six horizontal return tubular boilers, placed two abreast in three water-tight compartments. They will be 15 feet 3 inches in diameter and 21 feet 3 inches in length. The total grate surface will be 990 square feet; heating surface, 31,190 square feet; working steam pressure, 160 pounds. There will also be two auxiliary boilers above the protective deck. All the boilers are fitted to work under a forced draught on the air-tight fire room system.

The vessel will be fitted with every modern convenience that science can devise for the comfort and health of the officers and men, and will undoubtedly be the pride of the navy. Her cost, exclusive of armament, is not to exceed $3,500,000.

Trial Trip of the Ferryboat "Bremen."

The Hoboken Ferry Company made a trial trip with their new ferryboat "Bremen" on the 1st inst. Her performance was certainly very satisfactory, and elicited the highest praise from all the invited guests, including many prominent engineers. The boat made an excellent start from her slip at Hoboken, and proceeded at a comparatively high speed to Staten Island, and then returned and made a trip up the Hudson to Yonkers. During the return trip the speed of the boat was tested by running her over a measured mile. Against a very strong tide a speed of one mile in 5 minutes and 4 seconds was obtained, equal to 11.84 miles per hour. With the tide a mile was made in 3 minutes and 56 seconds, equal to 15¼ miles per hour, giving an average speed of about 13½ miles per hour. Although this is an excellent record for a ferryboat, she will undoubtedly do still better after she has been in service for a short time.

The engines, of which illustrations will be found in our issue of October 1st (current volume), were built by the W. & A. Fletcher Company, North River Iron Works, of Hoboken N. J. The general arrangement of cylinders and cranks is such as to balance all the reciprocating parts and enable the engines to work very smoothly and admirably; they appear to possess all the strength necessary for the severest service to which they may be put. In fact, the construction of the engines gives ample evidence of the experience of the designer.

The hull of the "Bremen," and that of her sister ship, the "Hamburg," now nearly completed, were built by T. S. Marvel & Co., of Newburgh, N. Y. Both are steel hull, double-deck screw ferryboats, and represent the latest step in a process of evolution in New York ferryboats, which began about five years ago.

Up to 1886 the standard engine for ferry service had been the beam engine, with jet-condenser and radial paddle-wheels. This type of engine had undergone no practical change for forty years, and though efforts had been made to use engines of other types to drive the radial wheels, the beam engine retained its place as the standard engine. But the good results obtained from the screw boats with multiple cylinder engines, now in use on the ferries of the Hoboken Company, the Erie Railroad and the Pennsylvania Railroad, indicate that the old type of ferryboats, on the North River, at least, is doomed.

In 1889 the boat "Bergen," whose engines were illustrated in our issue of November 24, 1888, being the first one built which had a screw at each end of a shaft running throughout the whole length of the boat, was placed in the service on the Hoboken ferries, and was found to fully realize the objects for which she was designed; but changes were found desirable in the details of the design of her main engines and general arrangement of the machinery. The following table will show the differences between the "Bremen," "Bergen," and "Orange," the latter vessel being taken as an excellent example of the old style of the beam engine ferryboat; all have steel hulls:

In the "Bremen" the most important change from the "Bergen" has been the adoption of two compound engines instead of one triple expansion engine.

In the "Bergen" the air-pump is driven from the low-pressure crosshead, while the circulating pump is an independent duplex one. In the "Bremen" the circulating and air-pumps are driven by auxiliary engines,

	Bremen.	Bergen.	Orange.
Built.	1891.	1889.	1886.
Length of L. W. L.	217 feet.	200 feet	217 feet.
Beam, L. W. L.	35 feet.	32 feet 2 inches.	32 feet.
Beam over guards	62 feet	62 feet	62 feet.
Displacement, L. W. L.	1 900,000 pounds	1,330,000 pounds.	1,740,000 pounds.
Number of seats	464	206	254.
Length of boiler	21 feet	23 feet	25 feet.
Diameter of boiler	9 feet.	8 feet	11 feet 6 inches.
Number of boilers	2	2	1.
Grate area.	91 square feet	80 square feet	81 square feet.
Ratio of grate area to total heating surface	36.6	43	38.
Type of engines	Compound propeller.	Triple expansion.	Low-pressure beam.
Diameter of cylinders.	2 of 20 in., 2 of 36 in.	18½, 27, 42 inches.	46 inches.
Stroke	2 feet 4 inches.	2 feet	10 feet.
Safety valve pressure.	120 pounds	160 pounds	45 pounds
Diameter of propellers	8 feet six inches.	8 feet.	Paddle-wheel.
Pitch of propellers	11 feet	9 feet	18 arms.
Number of cranks	4	3	1.

designed and built by the George F. Blake Manufacturing Company. These engines are illustrated in our issue of October 1st, current volume. They indicated less than one per cent. of the power of the main engines. The other pumps have also been furnished by the above company.

All these vessels are steered by Williamson's Steam Steering Gear. The "Bergen," "Bremen" and "Hamburg" are heated by the Sturtevant system of forced circulation.

A test of the engines of the "Bremen," by Prof. James E. Denton, of Stevens Institute, has been made. The following approximate results are compared with results obtained from similar tests of the "Bergen" and "Orange":

	Bremen.	Bergen.	Orange.
Evaporation of boilers from and at 212° Fahr. per lb of combustible...	11.57	11.40	11
Actual evaporation per lb. of coal	8.85	9 2	8 65
Percentage of ashes..	11.9	7 87	11
Steam consumed per hour for all purposes, per h. p. of main engine,	20.64	21.8	27
Pounds of coal per h. p. per hour	2.33	2.37	3.2

The decorations of the "Bremen's" cabins, by the Tiffany Glass Company, are handsome; the stairs from the lower to the upper cabins add much to the attractiveness of the design. The cabins are lighted by gas, and much attention has been given to promote the comfort and safety of the company's patrons, which undoubtedly will be appreciated as much as the trial trip, the liberality of the company at luncheon, and the music were appreciated by the large number of invited guests.

At the highest speed of the engines during the trial, scarcely a tremor, even at the extreme ends of the boat, directly over the propellers, was perceptible.

The maneuvering powers of the boat are excellent; she was headed up and down the river several times without stopping or reversing her engines.

The five screw ferryboats, which will shortly be in service on the North River, represent four different types of engines, all of them, however, applying the power in the same way as was first done on the "Bergen," to a shaft running the whole length of the vessel, and driving a screw at each end. Which of these types of engines will be found the most suitable for the conditions under which they have to work, is a question which only time and experience can determine. We have given illustrations of three of these types of engines in former issues. The remaining type is that of the "John McCullough," built for the Erie ferries by Nafey & Levy, of Philadelphia. She is driven by a two cylinder compound engine, with crank set at right angles. Like all previous North River ferryboats, the McCullough has but a single deck for passengers.

A new telegraphic machine has been brought out in Germany, of which the London *Times* says:

"The invention was primarily designed for long-distance telegraphing. It consists chiefly of two electro magnets, the one generating only a positive, and the other only a negative current. These set in motion a perforator, whereby holes are punched in the tape. The holes, instead of consisting of mere dots and dashes, as in the Morse system, are so arranged that, on joining them with lines, the letters of the Roman alphabet are formed. The chief merit of the machine is the extraordinary ease with which it can be worked. At a recent trial between the Berlin and Hamburg Stock Exchanges, a distance of nearly 200 miles, it was found possible to send from sixty-five to eighty-five messages per hour, or from twenty-five to thirty-five words per minute. The apparatus could, indeed, be worked much more rapidly, except that the operator's fingers could not move sufficiently fast. It is declared that the public will easily learn how to decipher the perforated tape, and will, in time, be able to perforate their own messages, and hand them to the telegraph officials for immediate transmission."

Messrs. Deacon, Maxwell & Dore, of Birmingham and Java, who carry on business in this country under the title of Samuel Fisher & Co., Nile Foundry, Birmingham, have just completed a large triple effect evaporating plant, which is about to be shipped, together with its vacuum engines and pumps, to Java. This machinery comprises only a small part of a complete set of plant which the firm have designed and supplied on instructions received from their resident partner in Java for a new estate in Dutch East India. The three castings are of mild steel, 7 ft. 6 in. diameter in the body, the over-all height of these being 18 ft. 6 in.; the tube plates are entirely of brass. Each vessel contains 750 2-in. brass tubes, or 2,250 tubes in all. Mr. Maxwell's patent vapor inlets are fitted to this apparatus, whilst other important improvements have been introduced, and a highly improved evaporative duty has been guaranteed.—*London Engineer.*

Machinists' Supplies and Iron.

NEW YORK, December 5, 1891.

Iron—American Pig—The general impression seems to be that prices have reached bottom figures, and that business will be done upon the present basis for some time.

We quote Standard Northern brands, No. 1 Foundry, at $16 to $17; No. 2 is selling at $15 to $16.50, and Grey Forge at $13.75 to $14 50. Southern brands of good quality are obtainable at $16 to $17.50 for No. 1 Foundry; $15.50 to $16 for No. 2; and $14.25 to $14.50 for No. 3.

Scotch Pig—We quote Coltness at $23, and Eglington at $20.50.

Antimony—No change of importance has taken place.

We quote Hallett's at 12¾c. to 13c.; Cookson's at 15¾c. to 16½c.; and L X at 15¼c. to 15½c.

Copper—Buyers are covering immediate wants only, and the market remains very quiet. Lake is freely offered at 11c.; Casting Copper rules steady at 10¾c.

Lead—Buyers are still holding off, and are unwilling to bid more than 4 20c. Supplies are held at 4 25c

Lard Oil—Prime City is held at 53c. to 54c.; Western, 52c.

Spelter—Little is being done. Supplies are held at 4.75c. for carload lots in New York.

Tin—The market is very quiet, and prices are steady. Values range from 19.85c. to 20c.

✻WANTED✻

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Wanted—First-class machinists. Address, The Ticonderoga Machine Company, Ticonderoga, N. Y.

Mechanical draftsman, best refs., wants position; N. Y. or vicinity preferred. Box 10, AM. MACHINIST.

Two or three good machinists wanted in general job shop. Kidder Mach. Co., Franklin Falls, N. H.

Wanted—Machinist experienced in vise work on engines from 2 to 20 H. P. Troy Engine and Machine Co., Troy, Pa.

Wanted—Situation by a practical steam engineer and machinist of 15 years' experience; first-class ref. given. Address H. F. Mellor, Rancocas, N. J.

Machine shop foreman wants to change; experience on engine and general mill work, also with indicator. Address J. A., care AMERICAN MACHINIST.

First-class mechanical draftsman, thorough in general machinery, shop experience, college graduate, wants situation. Box 11, AM. MACHINIST.

Wanted—Position as foundry foreman; 20 years' experience in Corliss engine and general jobbing work. Address Business, AMERICAN MACHINIST.

Wanted—Situation by mechanical draftsman and practical mechanic, on special or light machinery; can design, construct or take charge of construction. Box 7, AMERICAN MACHINIST.

Wanted—A first-class man as assistant manager in bicycle works; must be conversant with machine work and drawing. Apply by letter to the Crawford Manufacturing Company, Hagerstown, Md.

Wanted to employ a blacksmith who is an expert in hardening and tempering all grades of steel; a good place for the right man. Communicate with the Rand Drill Co., North Tarrytown, N. Y.

Wanted—Position as supt. or foreman, by a practical engineer and machinist of wide exp. on machine tools, steam engs., and electrical mach'y; well up in modern practice and the economical manage't of men; A1 references. Expert, care AM. MACHINIST.

Mech. draftsman, competent in Webb and cylinder printing presses, with a long exp. generally, wants engagement; a steady, quick worker, able to take charge of room or gang; with excellent ref. from last 6 years' employer. Send answers to R. Gotthell, draftsman, Jersey City Print'g Co., Jersey City, N. J.

Wanted—Brass molder capable of taking charge of a brass foundry for a large mfg. establishment in Ohio. Must understand thoroughly the molding and mixing of metals, and producing castings quickly and cheaply. A steady position to the right man. Address G. P., care AMERICAN MACHINIST.

An energetic young man (32), thorough mechanic, and has had extensive and successful experience in shop management; also good draftsman and designer of tools and appliances for getting out good work economically, wants to correspond with parties needing such a man. V. A. L., 1,857 North Eleventh Street, Philadelphia.

Wanted—Position as superintendent or engineer, by one with experience in modern steam plants and their management; has large acquaintance with engineers, and can command some trade; has designs in heavy and compound engines that are indorsed by the best engineers; would like to form connection where interest in business can constitute part of salary. Address Eng., AMER. MACH.

Wanted—A mechanical engineer to act as chief draftsman and assist in general management of the business; Corliss engines and refrigerating machinery a specialty; applicant will please state age, experience in the business, and salary expected; preference will be given to one competent and open for immediate engagement. Whitehill Engine and Pictet Ice Machine Co., Newburgh, N. Y.

✢ MISCELLANEOUS WANTS ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded

Cheap 2d hd. lathes & planers. S. M. York, Clev'd, O.

Auto. Steam Flue Cleaners. Kelley Co., Erie, Pa

Light and fine machinery to order; Foot Lathe Catalogue for stamp. E. O. Chase, Newark, N. J.

Best Bolt Header in the world for $50. Address C. H. Baush & Sons, Holyoke, Mass.

Wanted—Specialties to build for the Southern trade. Bluefield Iron Works, Bluefield, W. Va.

Corliss engs. and gen. mach'y designed, working drawings made. A. W. Jacobi, 136 Liberty St., N. Y.

Special machinery designed and built. C. F. Langston & Co., 70 N. 4th St., Philadelphia.

Special leather and cement for covering pulleys; no rivets required; local agents wanted. Crescent Mfg. Company, Cleveland, Ohio.

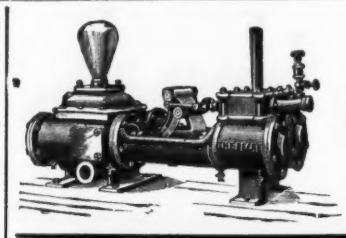
To manufacture light special and automatic machinery, novelties, models, patterns, tools, etc., by Orange Machine and Repair Works, Orange, N. J.

Wanted—A1 machinist or pattern maker, to take an interest in my machine shop, to manufacture small engines. 2615 & 2617 Strand, Galveston, Texas.

Good paying, well established machine business for sale, with tools and fixtures. Address "Machinery," care AMERICAN MACHINIST.

Wanted—A second-hand horizontal engine, 6 H. P., disk center crank, locomotive crosshead and guides, overhanging cylinder, plain slide valve; also one engine lathe, 28-inch swing, 14 foot bed. Address Julius Rhodes, Galesville, Wis.

Wanted—Engineers to write for catalogue of all the latest and most valuable mechanical, scientific and electrical books which are given free with each barrel of the Pittsburgh Boiler Scale Resolvent. Pittsburgh Boiler Scale Resolvent Co., Pittsb'gh, Pa.



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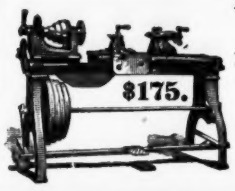

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Men test everything in this world by what it produces.
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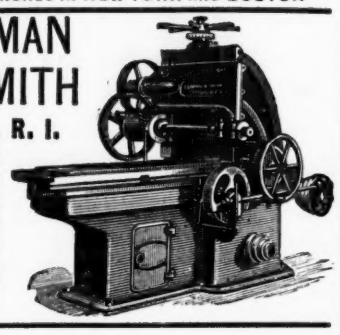

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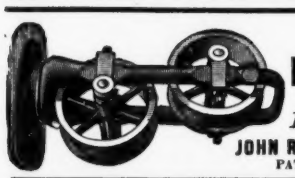

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The durability of the machine and the quantity—with quality—of work produced, is nowadays the measure of excellence and profit, and in this respect the "Hackney" is far in the lead.

It surpasses other power hammers in durability, speed and quality of work.

Write for catalogue and prices.
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WRIGLEY'S EMERY WHEEL DRESSERS.

FOR TRUING OF FACE AND SIDES
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Price, $2.50 each. Cutters, 5c. each.
Send for Circular. T. WRIGLEY, 85 & 87 Fifth Ave., Chicago.

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For TOOLS, DRILLS, DIES, &C.
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WILLIAM JESSOP & SONS, LD. | SHEFFIELD, ENGLAND. | Chief American Office, 91 JOHN ST., NEW YORK.

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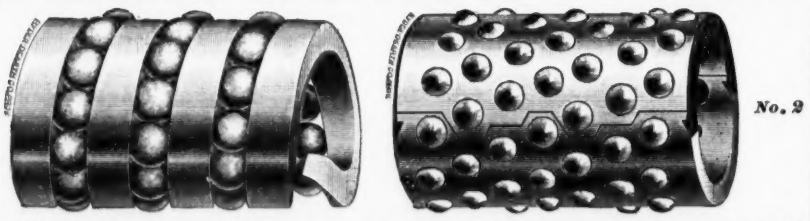

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R. MUSHET'S SPECIAL and TITANIC STEELS.
How to get the best results with "R. MUSHET'S SPECIAL STEEL." Greatly increase your speeds and feeds; then compare the work you turn off with that done by any other known Steel. This will make the first cost of "Mushet's" look insignificant.
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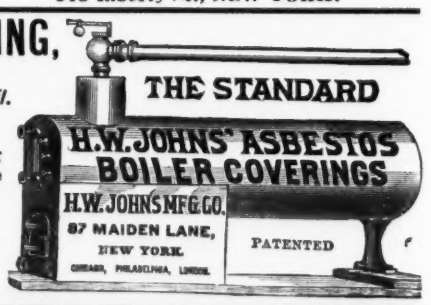

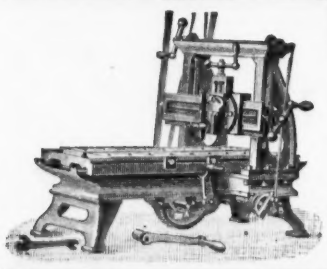

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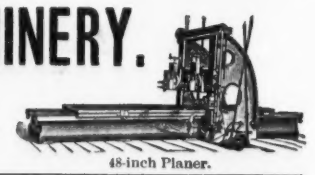
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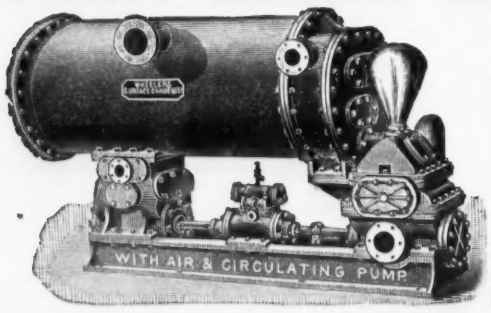

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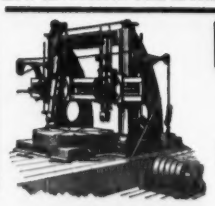

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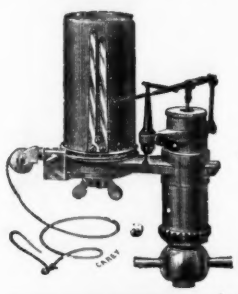

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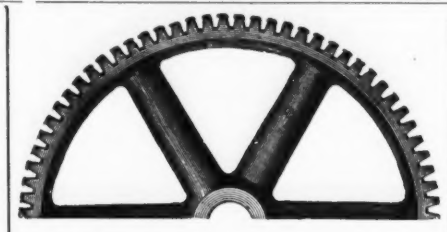

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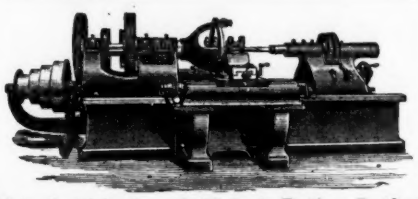

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Le Count's Heavy Steel Dog.
With Steel Screw, Lathe Made and Hardened.

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No.	Inch	Price.
1	3-8	$ .40
2	1-2	.50
3	5-8	.60
4	3-4	.60
5	7-8	.70
6	1	.70
7	1 1-8	.80
8	1 1-4	.80
9	1 3-8	.95
10	1 1-2	.95
11	1 3-4	1.10
12	2	1.20
13	2 1-4	1.35
14	2 1-2	1.45
15	3	1.60
16	3 1-2	1.80
17	4	2.10
18	4 1-2	2.75
19	5	3.25
Full set of 19		$23.60
20 (ext.)	5 1-2	4.00
21 (ext.)	6	5.00

This Dog has a Very Heavy Bore, so that if the thread wears a Heavier Screw can be substituted.

When ordering, state as above, whether a full set of 19, or a small set of 8. Users of these dogs prefer them to any other make.

One Small Set of 8—by 1-4 inches to 20 inch, - - $ 6.25
One Set of 12—by 1-4 in. to 2 in. continued by 1 2 in. to 4 in. 13.25

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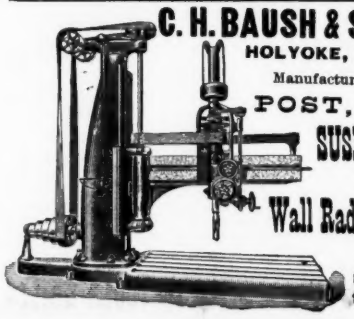

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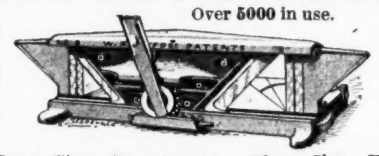

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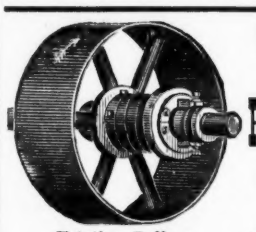

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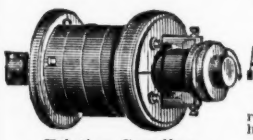

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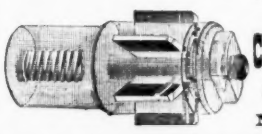

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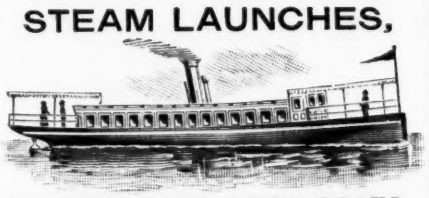

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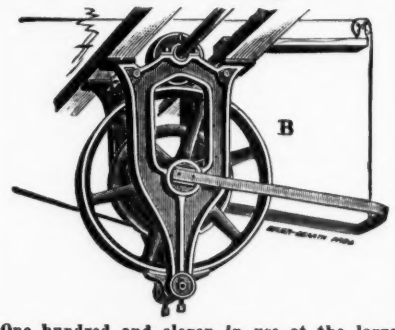

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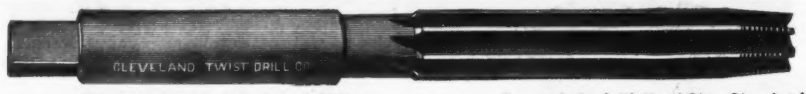

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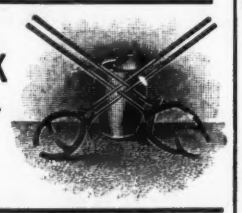

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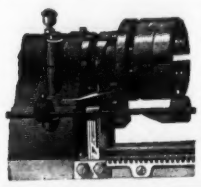

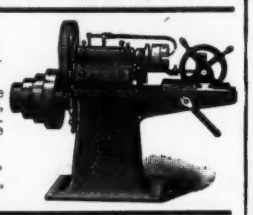

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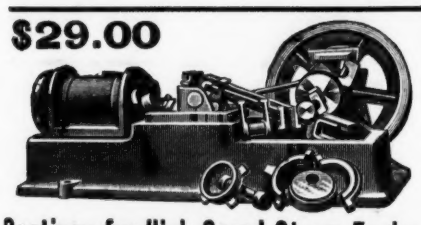

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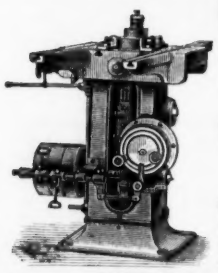

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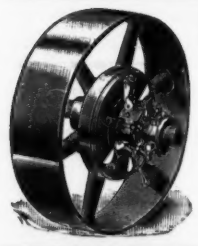

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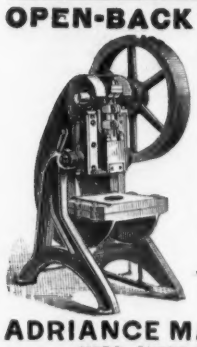

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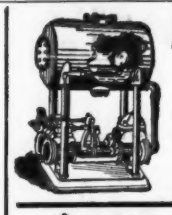

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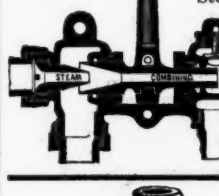
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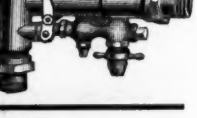
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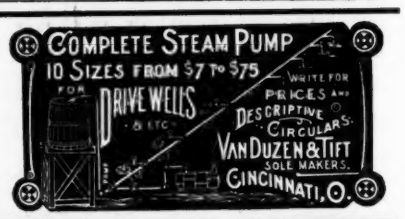
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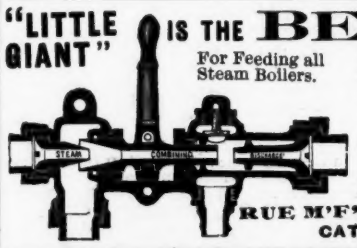

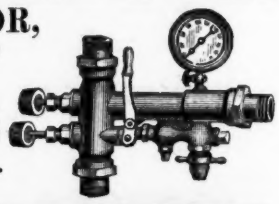

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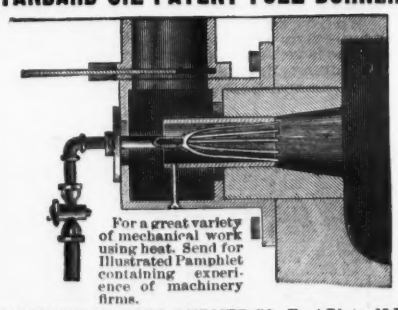

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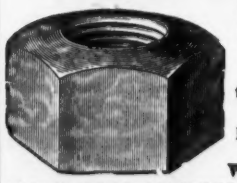

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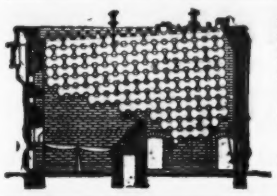

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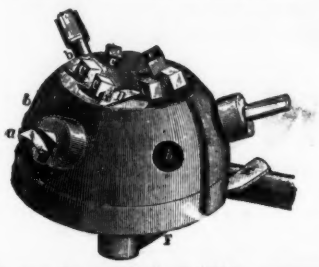

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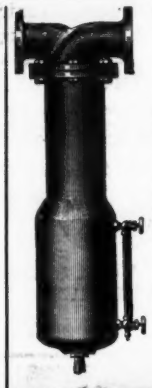

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15¼ "	17 "
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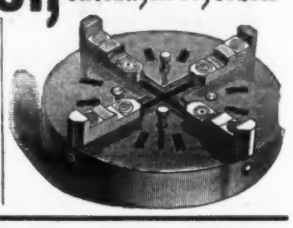

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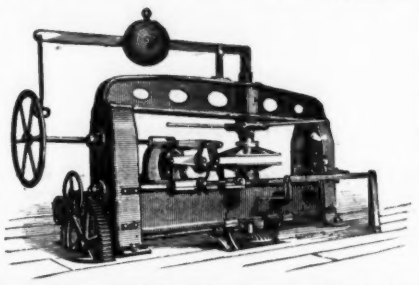

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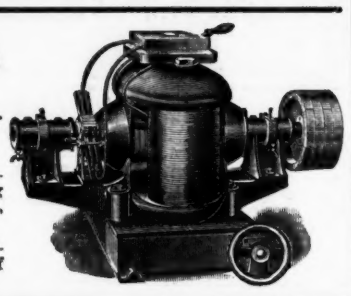

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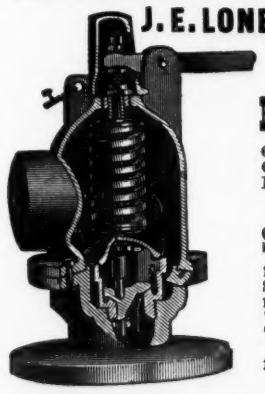

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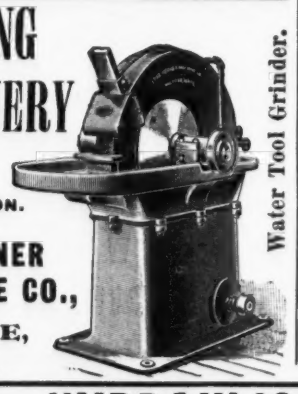

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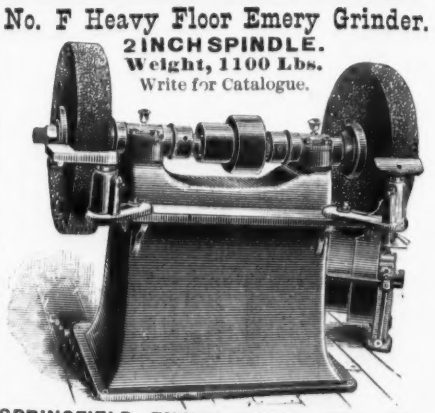

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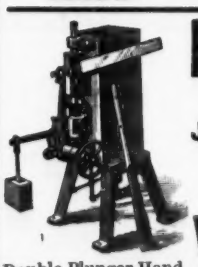

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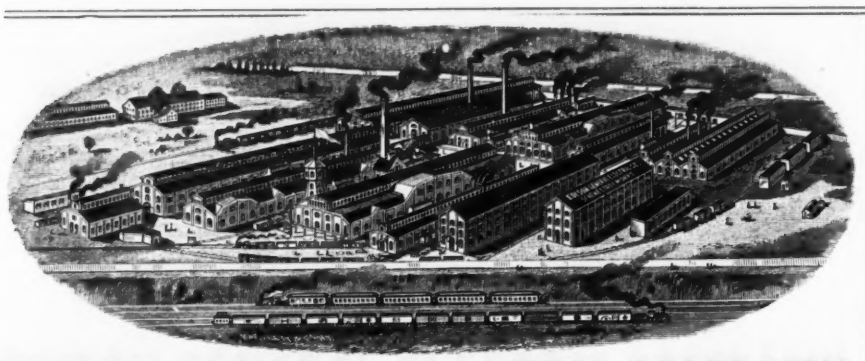

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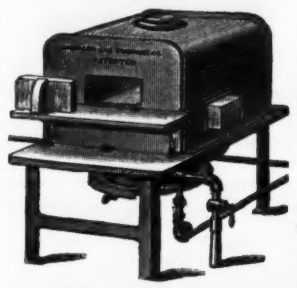

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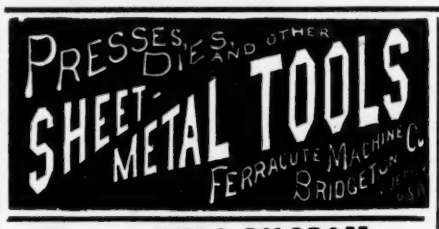

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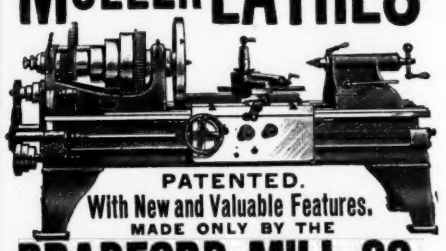

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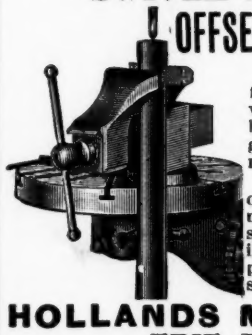

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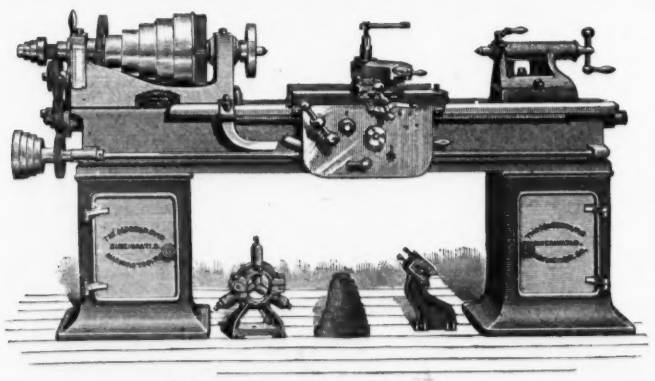

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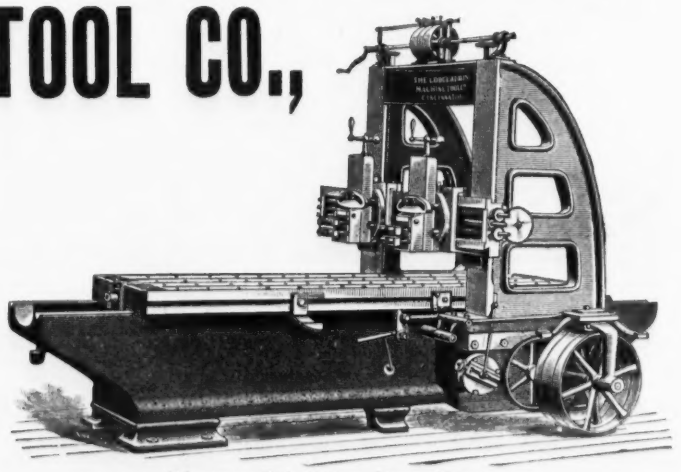

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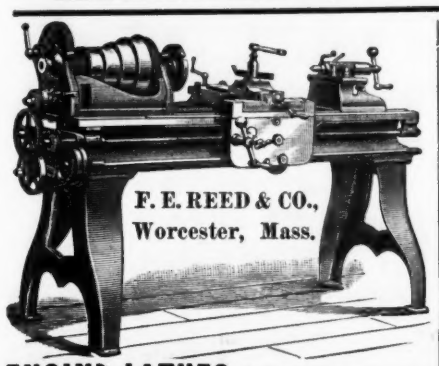

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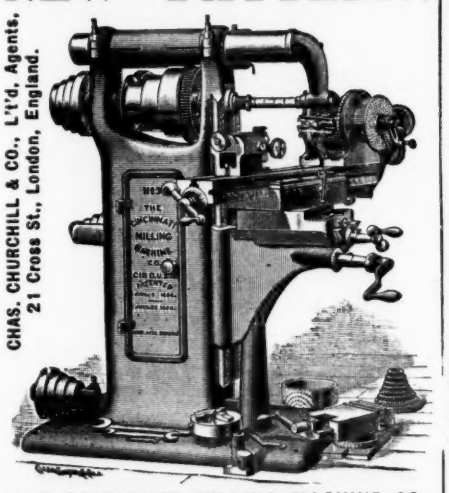

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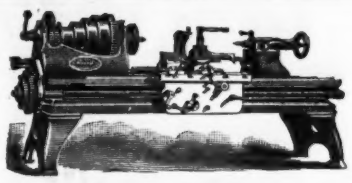

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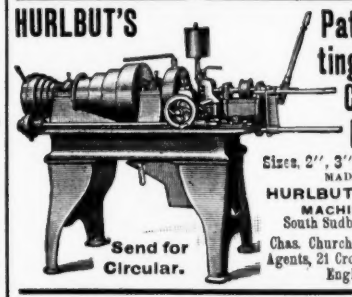

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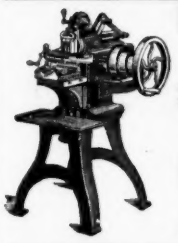

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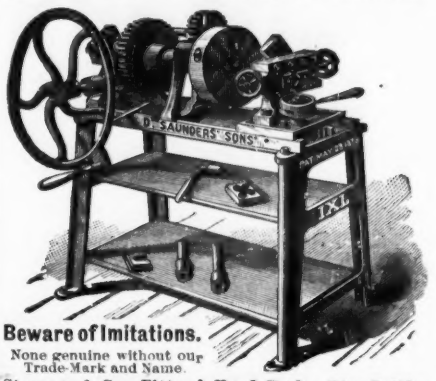

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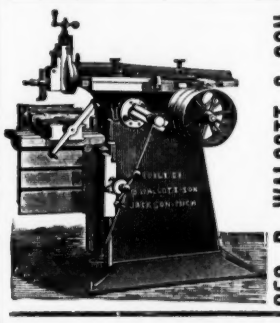

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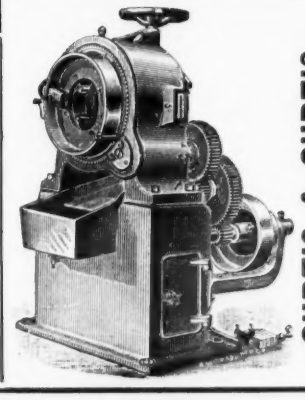

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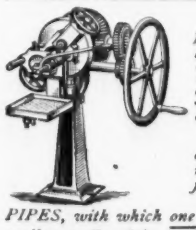

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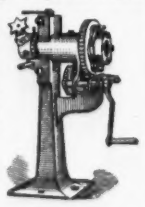

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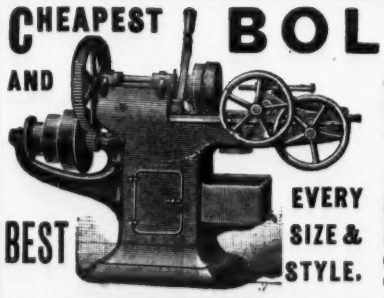

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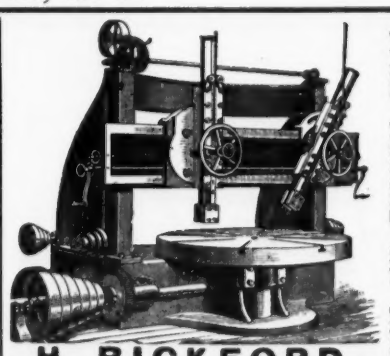

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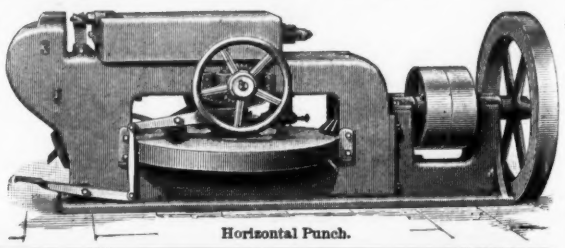
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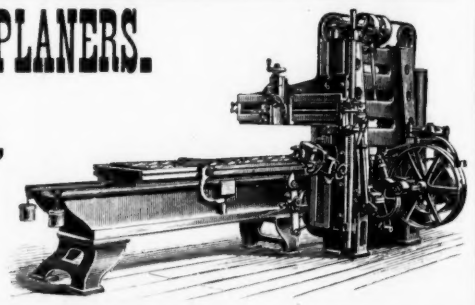

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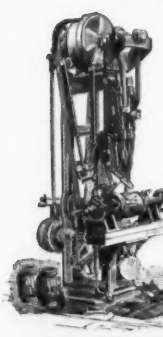
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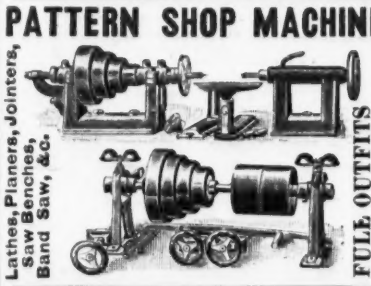

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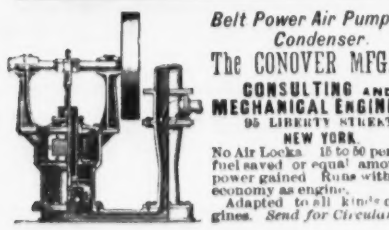

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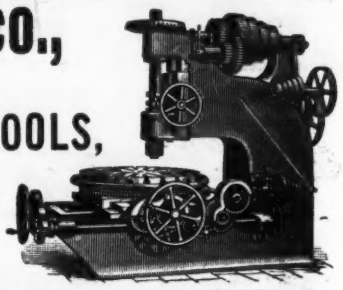

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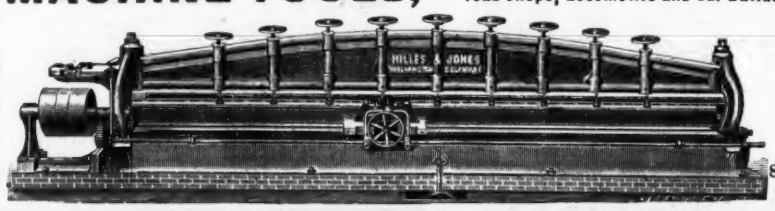

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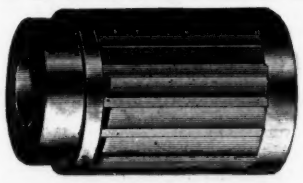

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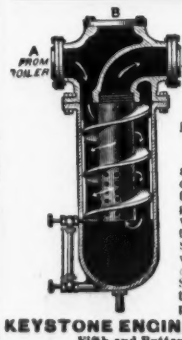

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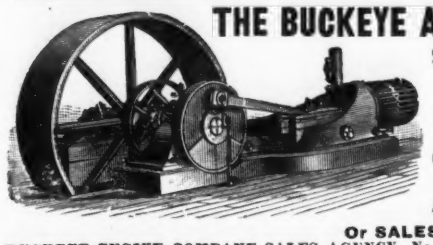

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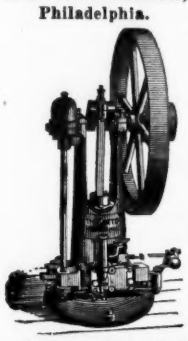

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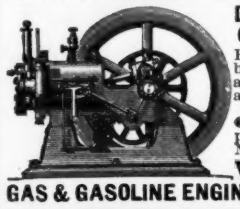

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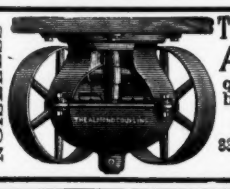

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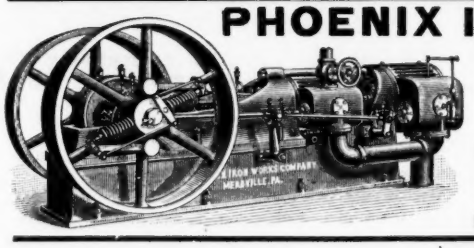

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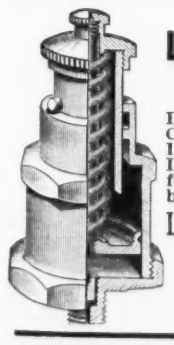

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" "	18 in.	"	6-8-10 ft.	beds, Hendey.
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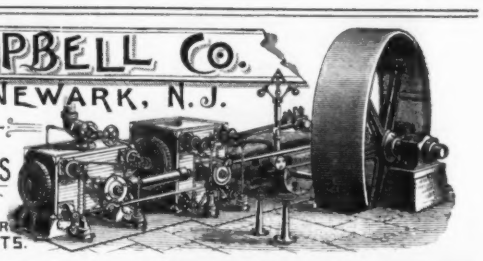

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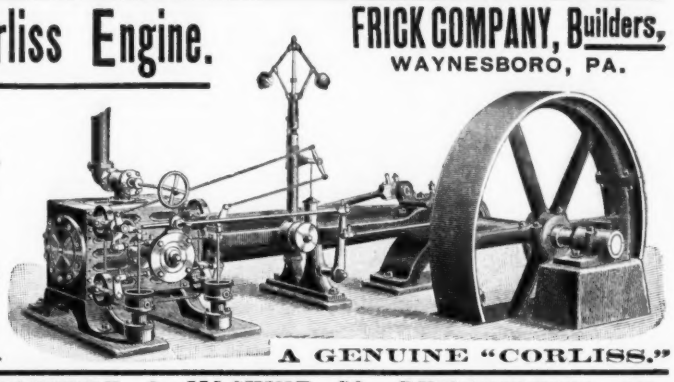

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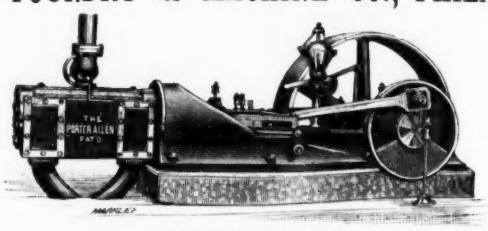

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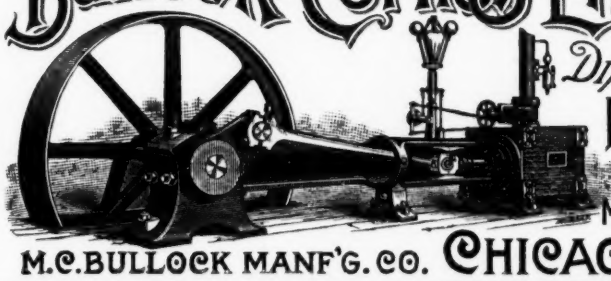

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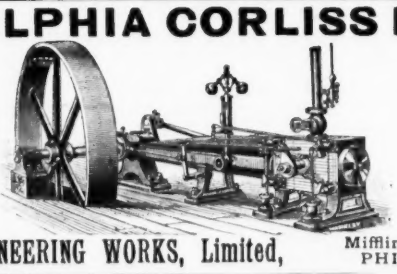

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1 Planer, 24 in. wide by 4 ft. long,	L. W. Pond Mch. Co. new.
1 Planer, 24 in. do 5 ft. do	do do
1 Planer, 24 in. do 6 ft. do	do do
1 Planer, 28 in. do 6 ft. do	do do
1 Planer, 28 in. do 8 ft. do	do do
1 Planer, 32 in. do 10 ft. do	do do
Gap Engine Lathe, 28 inch swing over shears, 56 inch swing in gap, 26 ft. bed,	English Make.
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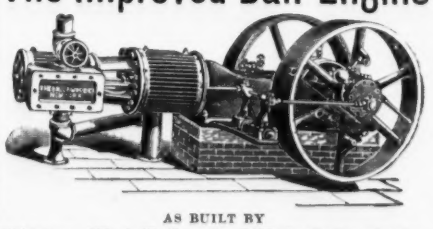

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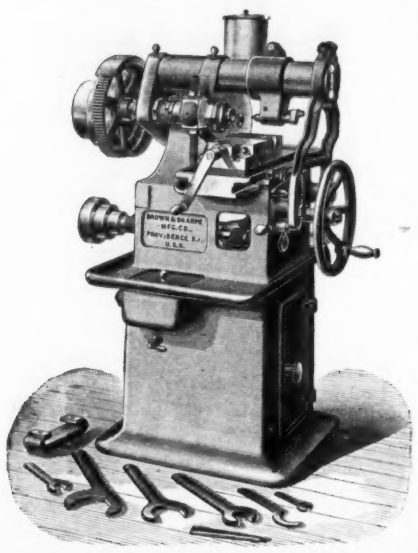

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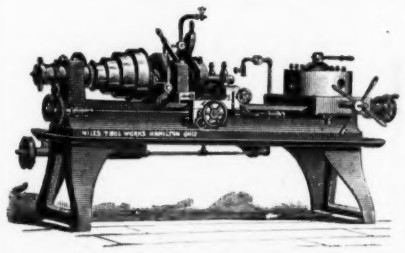

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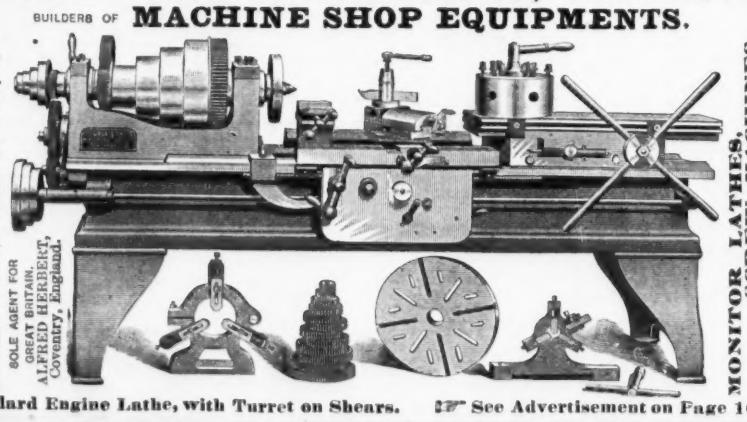

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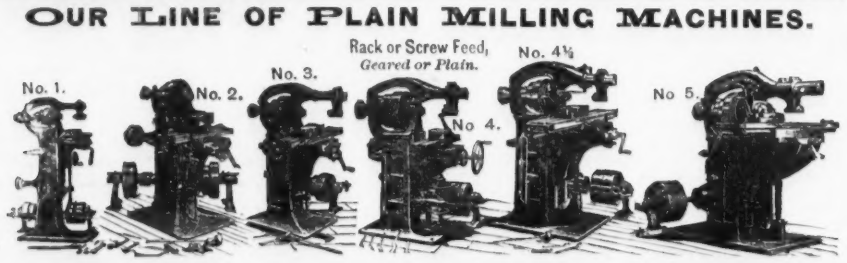

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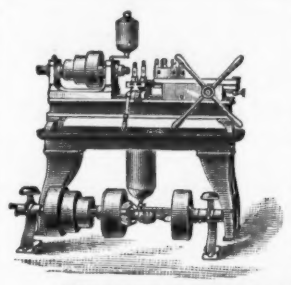

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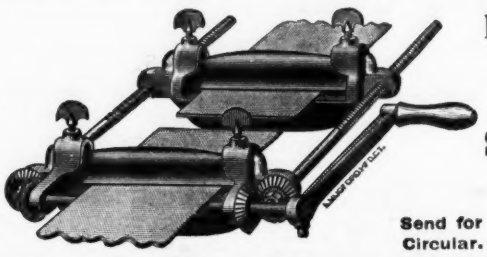

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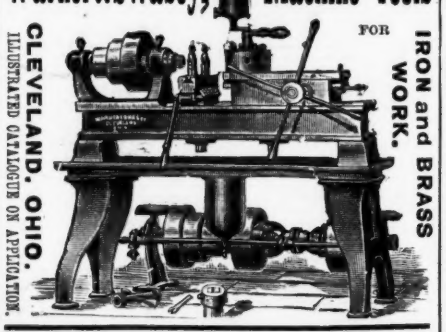

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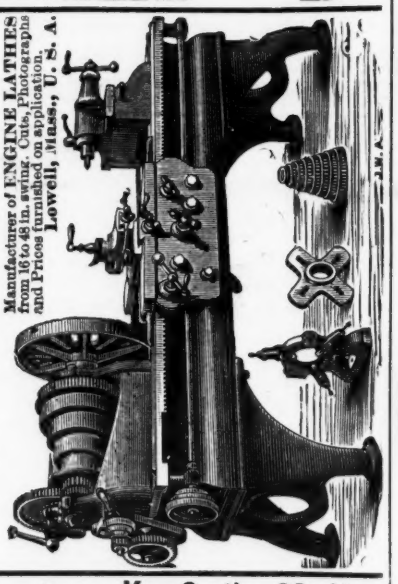

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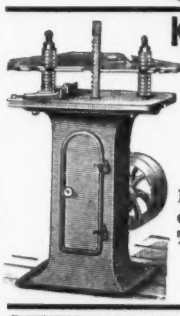

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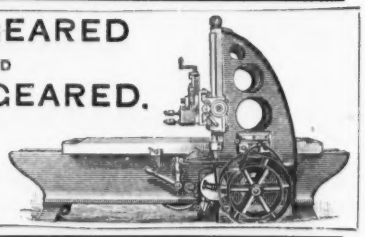

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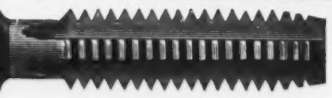

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